BRITISH COLUMBIA
MINISTRY OF FORESTS

Arrowsmith Timber Supply Area

Rationale for Allowable Annual Cut (AAC) Determination

Effective September 1, 2002

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Larry Pedersen
Chief Forester

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Objective of this document

This document is intended to provide an accounting of the factors I have considered and the rationale I have employed as chief forester of British Columbia in making my determination, under Section 8 of the *Forest Act*, of the allowable annual cut (AAC) for the Arrowsmith Timber Supply Area (TSA). This document also identifies where new or better information is needed for incorporation in future determinations.

Description of the TSA

The Arrowsmith TSA is located on the southern part of Vancouver Island and consists of several fragmented areas within the South Island Forest District. The TSA is located south of the Strathcona TSA (Campbell River) and shares borders with Tree Farm Licences (TFLs) 25, 44, 46, 54, and 57. It also borders many reserves, parks, municipal and private lands. Although the forest district covers about 1.57 million hectares, the actual timber supply area covers only 112 050 hectares of productive forest land managed by the British Columbia Forest Service.

The landscape of the Arrowsmith TSA is diverse. It ranges from nutrient rich, moist floodplains in the valley bottoms to alpine meadows. Most of the forested lands within the TSA lies within the Coastal Western Hemlock biogeoclimatic zone, with the remainder in the Mountain Hemlock zone at high elevations or the Coastal Douglas Fir zone at lower elevations on the drier east side of Vancouver Island. The eastern side is comparatively drier with gentler topography than the western portions of the TSA.

The forests of the TSA are diverse, and slightly more than half of the forests on the land base contributing to timber supply are considered to have medium or good site productivity. Major tree species include Douglas-fir, hemlock and true firs, while other species such as western redcedar, spruce, red alder, and maple also occur. The forests of the TSA have a relatively long history of harvesting, and as a result there are rapidly maturing second-growth forests on the lower elevation sites, which are accessible and highly productive. Almost half of the stands on the timber harvesting land base are between 21 and 100 years of age.

A portion of the timber harvesting land base within the TSA —5935 hectares— is located within Clayoquot Sound, a 265 000-hectare area on the west coast of Vancouver Island bounded by the provincial Government's 1993 Clayoquot Sound Land Use Decision.

In 2000, the population of the South Island Forest District was approximately 557,900 people. About 60 percent of the people reside within the Capitol Regional District, including the City of Victoria. Other major population centres are Duncan, Ladysmith, Nanaimo, North Cowichan, Parksville, Qualicum Beach and Port Alberni; smaller communities include Tofino, Ucluelet, Lake Cowichan, Nanoose, Chemainus, Union Bay and Fanny Bay.

There are many First Nations with reserves or traditional territories within the Arrowsmith TSA. All but three First Nations are represented by the following four tribal councils and three treaty associations: the Alliance Tribal Council; the First Nation South Island Tribal Council; the Mid-Island Tribal Council; the Nuu-chah-nulth Tribal Council;

the Hul'qumi'nun Treaty Group; the Te'Mexw Treaty Association; and the Kwakiutl Laich-kwil Tach Nations Treaty Society.

History of the AAC

In 1986, the Arrowsmith TSA was formed from portions of the former Nootka and Quadra TSAs. At that time, the AAC was set at 392 890 cubic metres. An additional allocation of 3870 cubic metres was made in 1989 for deciduous species. In 1992, the AAC was increased to 498 250 cubic metres to account for a transfer of land from TFL 46 to the TSA.

In December 1996, the chief forester set the AAC at 400 000 cubic metres, a decrease of 17 percent from the previous level. This AAC was partitioned as follows: 380 000 cubic metres for areas outside of Clayoquot Sound, 13 700 cubic metres for areas inside Clayoquot Sound, and 6300 cubic metres for red alder-leading stands.

The AAC of 400 000 cubic metres is apportioned by the Minister of Forests as follows:

Apportionment	Cubic metres/year	Percentage
Forest licences – replaceable	151 419	37.85
Forest licences – non-replaceable	74 935	18.73
Timber sale licences – replaceable	11 349	2.84
Small Business Forest Enterprise Program (SBFEP)	102 787	25.70
SBFEP bid proposal	46 010	11.50
Forest Service Reserve	1 000	0.25
Woodlot licences	12 500	3.13
Total	**400 000**	**100.0**

New AAC determination

Effective September 1, 2002 the new AAC for the Arrowsmith TSA will be 373 300 cubic metres. This harvest level includes a partition of 6300 cubic metres per year for red alder-leading stands with at least 50 percent deciduous species by volume, and 13 700 cubic metres per year for the Clayoquot Sound area. This AAC excludes all volume issued to woodlot licences since the 1996 determination.

This AAC will remain in effect until a new AAC is determined, which may take place within five years of this determination.

Information sources used in the AAC determination

Information considered in determining the AAC for the Arrowsmith TSA include the following:

- *Arrowsmith TSA Timber Supply Analysis*, BC Forest Service (BCFS), August 1995;
- *Arrowsmith TSA Rationale for AAC determination*, BCFS, December1996;
- *Arrowsmith TSA Analysis Report and Public Discussion Paper*, BCFS, Sept. 2001;
- *Arrowsmith TSA Summary of Public Input*, BCFS, July 2002;
- Letter from the Minister of Forests to the chief forester, dated July 28, 1994, stating the Crown's economic and social objectives for the province (Appendix 3);
- Memorandum from the Minister of Forests to the chief forester, dated February 26, 1996, stating the Crown's economic and social objectives for the province regarding visual resources (Appendix 4);
- Letter from the Minister of Forests to the chief forester, dated September 17, 1996, stating the Crown's economic and social objectives regarding Clayoquot Sound (Appendix 5);
- Technical review and evaluation of current operating conditions through comprehensive discussions with BCFS staff, including the AAC determination meeting held in Port Alberni, February 25 and 26, 2002;
- *Forest Practices Code of British Columbia Act*, consolidated to March 2001;
- *Forest Practices Code of British Columbia Act* Regulations and Amendments, current as of March 2001;
- Forest Practices Code of British Columbia Guidebooks, BCFS and former MELP;
- *Growth and Morphological Development of Douglas-fir and Western Hemlock on Forest Edges in the Alberni Valley, BC*, Michael Scot Zens, University of Washington, U.S.A., 1995;
- *Site index adjustments for old-growth stands based on veteran trees.* Working Paper # 36, G. Nigh. BCFS Research Branch, Victoria, B.C., 1998;
- *Site index adjustments for old-growth stands based on paired plots.* Working Paper # 37, A. Nussbaum. BCFS Research Branch, Victoria, B.C., 1998;
- *Managing Visual Resources to Mitigate Impacts on Timber Supply in the Vancouver Forest Region: The Final Report (2nd Edition).* BCFS, Vancouver Forest Region, February 11, 1999;
- *Regional Landscape Unit Planning Strategy*, BCFS, Vancouver Forest Region, July 2, 1999;
- *Coastal Watershed Assessment Procedure Guidebook (CWAP). Interior Watershed Assessment Procedure Guidebook (IWMP), Second Edition.* Province of British Columbia, Victoria, B.C., April 1999;
- *Forest Practices Code Timber Supply Analysis*, 1996;
- *Identified Wildlife Management Strategy*, February 1999;
- *Landscape Unit Planning Guide*, March 1999;
- *Higher Level Plans: Policy and Procedures*, December 1996.

Role and limitations of the technical information used

Section 8 of the *Forest Act* requires the chief forester to consider biophysical as well as social and economic information in AAC determinations. A timber supply analysis, and the inventory and growth and yield data used as inputs to the analysis, typically form the major body of technical information used in AAC determinations. Timber supply analyses and associated inventory information are concerned primarily with biophysical factors—such as the rate of timber growth and definition of the land base considered available for timber harvesting—and with management practices.

However, the analytical techniques used to assess timber supply are necessarily simplifications of the real world. There is uncertainty about many of the factors used as inputs to timber supply analysis due in part to variations in physical, biological and social conditions, although ongoing science-based improvements in the understanding of ecological dynamics will help reduce some of this uncertainty.

Furthermore, technical analytical methods such as computer models cannot incorporate all of the social, cultural and economic factors that are relevant when making forest management decisions. Therefore, technical information and analysis do not necessarily provide complete answers or solutions to forest management problems such as AAC determinations. The information does, however, provide valuable insight into potential impacts of different resource-use assumptions and actions, and thus forms an important component of the information required to be considered in AAC determinations.

In determining the AAC for the Arrowsmith TSA, I have considered known limitations of the technical information provided, and I am satisfied that the information provides a suitable basis for my determination.

Statutory framework

Section 8 of the *Forest Act* requires the chief forester to consider particular factors in determining AACs for TSAs and TFLs. Section 8 is reproduced in full as Appendix 1.

Guiding principles for AAC determinations under section 8 of the *Forest Act*

I note that the following guiding principles apply to all areas in the Arrowsmith TSA outside of Clayoquot Sound. The "Clayoquot Sound" portion of the decision, including a unique set of guiding principles, has been discussed separately below.

Rapid changes in social values and in our understanding and management of complex forest ecosystems mean that there is always some uncertainty in the information used in AAC determinations. In making a large number of determinations for many forest management units over extended periods of time, administrative fairness requires consistency when addressing these changes and associated uncertainties. To make my approach in these matters explicit, I have set out the following body of guiding principles. If in some specific circumstance it is necessary to deviate from these principles, I will provide a detailed reasoning in the considerations that follow.

Two important ways of dealing with uncertainty are:

(i) minimizing risk, in respect of which in making AAC determinations, I consider the uncertainty associated with the information before me, and attempt to assess the various potential current and future social, economic and environmental risks associated with a range of possible AACs; and

(ii) redetermining AACs frequently, in cases where projections of short-term timber supply are not stable, to ensure they incorporate current information and knowledge—a principle that has been recognized in the legislated requirement to redetermine these AACs every five years. The adoption of this principle is central to many of the guiding principles that follow.

In considering the various factors that Section 8 of the *Forest Act* requires me to take into account in determining AACs, I attempt to reflect as closely as possible operability and forest management factors that are a reasonable extrapolation from current practices. It is not appropriate to base my decision on unsupported speculation with respect either to factors that could work to increase the timber supply—such as optimistic assumptions about harvesting in unconventional areas, or using unconventional technology, that are not substantiated by demonstrated performance—or to factors that could work to reduce the timber supply, such as integrated resource management objectives beyond those articulated in current planning guidelines or the *Forest Practices Code of British Columbia Act* and its associated regulations (the Forest Practices Code).

The *Forest Practices Code of British Columbia Regulations* were originally approved by the Lieutenant Governor in Council on April 12, 1995, and released to the public at that time. The *Forest Practices Code of British Columbia Act* was brought into force on June 15, 1995. In 2002, government has proposed a new results-based Code for forest and range practices, which could be implemented in April 2003.

Although the Forest Practices Code was fully implemented in1997, the timber supply implications of some of its provisions, such as those for landscape-level biodiversity, still remain uncertain, particularly when considered in combination with other factors. In each AAC determination I take this uncertainty into account to the extent possible in context of implemented practices, given the best available information.

The eventual timber supply impacts associated with strategic land-use decisions resulting from the various planning processes—including the Protected Areas Strategy, Land and Resource Management Planning (LRMP), or other area-based planning processes—are often discussed in relation to current AAC determinations. Since the outcomes of these planning processes are subject to significant uncertainty before formal approval by government, it has been and continues to be my position that in determining AACs it would be inappropriate to attempt to speculate on the timber supply impacts that will eventually result from land-use decisions not yet taken by government. Thus I do not account for possible impacts of existing or anticipated recommendations made by such planning processes, nor do I attempt to anticipate any action the government could take in response to such recommendations.

Moreover, even where government has made a formal land-use decision, it may not always be possible to fully analyze and account for the consequent timber supply impacts in a

current AAC determination. In many cases, government's land-use decision must be followed by a number of detailed implementation decisions. For example, a land-use decision may require the establishment of resource management zones and resource management objectives and strategies for these zones. Until such implementation decisions are made it would be impossible to fully assess the overall impacts of the land-use decision. Nevertheless, the legislated requirement for regular AAC reviews will ensure that future determinations address ongoing plan implementation decisions.

However, where specific protected areas have been designated by legislation or by order in council, these areas are deducted from the timber harvesting land base and are no longer considered to contribute to the timber supply in AAC determinations.

The Arrowsmith TSA falls within the purview of two land use decisions—the Vancouver Island Land Use Plan (VILUP) and the Clayoquot Sound Land Use Decision (CSLUD). Government's acceptance of these two land-use plans has clarified many aspects of land and resource use and management for the Arrowsmith TSA. In the course of implementing these decision, those parameters which are known to affect timber supply have been incorporated into the timber supply analysis.

In addition to the CSLUD, the provincial government has accepted the recommendations in the report of the *Scientific Panel for Sustainable Forest Practices in Clayoquot Sound*. Therefore, in accordance with the Minister of Forests' stated social and economic objectives of the Crown in the Clayoquot Sound area (see Appendix 5) I view the ongoing implementation of the Scientific Panel recommendations as a factor I must consider under section 8 of the *Forest Act*. In this determination I have considered, when possible, the decisions that have been made through the implementation process with the aim of ensuring the harvest level does not compromise the implementation of the panel recommendations. In order to attain this goal I have composed a set of guiding principles unique to AAC determinations for areas within Clayoquot Sound. These principles, as discussed below, will apply only to the Clayoquot Sound portions of the three management units which have area in Clayoquot Sound.

A number of intensive silviculture activities have been undertaken in the past that have the potential to affect timber supply, particularly in the long term. As with all components of my determinations, I require sound evidence before accounting for the effects of intensive silviculture on possible harvest levels. Nonetheless, I will consider information on the types and extent of planned and implemented practices as well as relevant scientific, empirical and analytical evidence on the likely magnitude and timing of any timber supply effects of intensive silviculture.

Some have suggested that, given the large uncertainties present with respect to much of the data in AAC determinations, any adjustments in AAC should wait until better data are available. I agree that some data are not complete, but this will always be true where information is constantly evolving and management issues are changing. Moreover, in the past, waiting for improved data created the extensive delays that resulted in the urgency to redetermine many outdated AACs between 1992 and 1996. In any case, the data and models available today are improved from those available in the past, and will undoubtedly provide for more reliable determinations.

Others have suggested that, in view of data uncertainties, I should immediately reduce some AACs in the interest of caution. However, any AAC determination I make must be the result of applying my judgement to the available information, taking any uncertainties into account. Given the large impacts that AAC determinations can have on communities, no responsible AAC determination can be made solely on the basis of a response to uncertainty. Nevertheless, in making my determination, I may need to make allowances for risks that arise because of uncertainty.

With respect to First Nations' issues, I am aware of the Crown's legal obligations resulting from recent decisions in the British Columbia Court of Appeal and the Supreme Court of Canada. The AAC that I determine should not in any way be construed as limiting the Crown's obligations under these decisions. In this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within the Arrowsmith TSA. My determination is also independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply.

The British Columbia Court of Appeal decided in March 2002 that pending the final determination of the existence of aboriginal rights and title, the Crown has an obligation to consult with First Nations with respect to asserted rights and title in a manner proportional to the strength of the interests. I consider any information brought forward respecting First Nations' interests. In particular I consider information related to actions taken to protect interests, including operational plans that describe forest practices designed to seek to address such First Nations' interests. In this context, I re-iterate that my AAC determination does not prescribe a particular plan of harvesting activity, nor does it involve allocation of the wood supply to any particular party.

If, subsequent to this determination, I become aware of information respecting First Nations interests that would substantially alter the estimate of timber supply underlying my determination, I may revisit my determination.

Overall, in making AAC determinations, I am mindful of the mandate of the Ministry of Forests as set out in Section 4 of the *Ministry of Forests Act* and of my responsibilities under the *Forest Practices Code of British Columbia Act* and the *Forest Act*.

Guiding principles for AAC determinations which include portions of Clayoquot Sound

For determining AACs for areas that include portions of Clayoquot Sound, I have developed specific guiding principles intended to account for the circumstances resulting from the area's complex history of planning and management. In my previous 1996 AAC determination for the Arrowsmith TSA, I prepared these principles following the Clayoquot Sound Land Use Decision (CSLUD) and government's endorsement of the Scientific Panel recommendations, which have been applied in all AAC determinations to date for areas that include portions of Clayoquot Sound.

An important consideration in determining an appropriate AAC for the Arrowsmith TSA is the inclusion of the area covered by the 1993 CSLUD. Of particular importance, is the consideration of the appropriate application of the recommendations contained in the three-volume report by the Scientific Panel that was adopted by government in 1995.

The Scientific Panel recommended that all forest activities within Clayoquot Sound be based on equal partnership between the Nuu-chah-nulth and the Province of British Columbia. The provincial government created the Clayoquot Sound Central Region Board (CRB) to oversee all development in the CSLUD area. The government endorsement of the Scientific Panel reports as well as the creation of the CRB enabled extensive First Nations involvement in the planning and management of activities in the Sound. The existence of the CRB, and its role in resource management in Clayoquot Sound, is another important consideration for the determination of an AAC for the Arrowsmith TSA.

Additionally, in a letter to the chief forester dated September 17, 1996 (see Appendix 5), the Minister of Forests, recognizing the unique and complex history of forest management in the Clayoquot area, expressed as an economic and social objective of the Crown a confirmation of government's intention that timber harvesting continue to be a forest management objective for the Clayoquot area and that this management be carried out in accordance with the Forest Practices Code and the recommendations of the Scientific Panel. In accordance with this, it is appropriate to include in my considerations under section 8 of the *Forest Act* the ongoing implementation of the Scientific Panel's recommendations.

In determining an AAC for the Arrowsmith TSA, in my considerations under section 8 of the *Forest Act*, I will account for known implications of the provincial government's CSLUD and, in view of the social and economic objectives of the Crown as expressed for the Clayoquot Sound area by the Minister of Forests, I will also account as fully as is technically possible at this time for the recommendations of the Scientific Panel.

The role of the timber supply analysis

In considering the factors required under Section 8 of the *Forest Act* to be addressed in AAC determinations, I am assisted by timber supply forecasts provided to me through the timber supply review process.

For each AAC determination for a TSA, a timber supply analysis is carried out using an information package including data and information from three categories—land base inventory, timber growth and yield, and management practices. Using this set of data and a computer model (Forest Stand Simulator, or FSSIM), a series of timber supply forecasts is produced, reflecting different starting harvest levels, rates of change over time, and potential trade-offs between short- and long-term harvest levels.

From this range of forecasts, one is chosen which attempts to avoid excessive changes from decade to decade and significant timber shortages in the future, while ensuring the long-term productivity of forest lands. This is known as the 'base case' forecast, and forms the basis for comparison when assessing the effects of uncertainty on timber supply.

Because it represents only one in a number of theoretical forecasts, and because it incorporates information about which there may be some uncertainty, the base case forecast for a TSA is not an AAC recommendation. Rather, it is one possible forecast of timber supply, whose validity—as with all the other forecasts provided—depends on the validity of the data and assumptions incorporated into the computer simulation used to generate it.

Therefore, much of what follows in the considerations outlined below is an examination of the degree to which all the assumptions made in generating the base case forecast are realistic and current, and the degree to which its predictions of timber supply must be adjusted, if necessary, to more properly reflect the current situation.

These adjustments are made on the basis of informed judgement, using current available information about forest management, which may well have changed since the original information package was assembled. Forest management data is particularly subject to change during periods of legislative or regulatory change, such as the enactment of the Code, or during the implementation of new policies, procedures, guidelines or plans.

Thus it is important to remember, in reviewing the considerations which lead to the AAC determination, that while the timber supply analysis with which I am provided is integral to those considerations, the AAC determination itself is not a calculation but a synthesis of judgement and analysis in which numerous risks and uncertainties are weighed. Depending upon the outcome of these considerations, the AAC determined may or may not coincide with the base case forecast. Judgements that may be based in part on uncertain information are essentially qualitative in nature and, as such, are subject to an element of risk. Consequently, once an AAC has been determined, no additional precision or validation may be gained by attempting a computer analysis of the combined considerations to confirm the exact AAC determined.

Base case forecast for the Arrowsmith TSA

The base case forecast presented in the *September 2001 Arrowsmith Timber Supply Area Analysis Report* incorporated the most current available information on forest management, land base and timber yields for the TSA. The base case forecast included specific assumptions about the TSA that are discussed in detail in the analysis report.

The base case forecast for the Arrowsmith TSA was developed using factors appropriate to the TSA and was made available for public review and comment. In the base case forecast, the current AAC could not be achieved, and an initial harvest level of 357 000 cubic metres per year, an 11 percent decrease was projected. This initial level could only be maintained for one decade decreasing by 11 percent per decade for several decades until it reached a mid-term level of 263 000 cubic metres per year. In the seventh decade, the harvest level increased by 9 percent to a steady long-term harvest level of 286 250 cubic metres per year.

The base case forecast includes the following three components:

- a harvest level of 6300 cubic metres per year from red alder-leading stands for the first decade was projected. After the first decade, the harvest level for these stands declined to zero for 15 years, then increased to the steady long-term level of 3000 cubic metres per year. This assumption is discussed further under *deciduous stands*.
- the volume contribution from the Clayoquot Sound area was based on the recommendations found in the Clayoquot Sound Scientific Panel Report. Based on a non-declining harvest flow, a steady harvest level of 11 000 cubic metres per year was projected. This assumption is discussed further under *Clayoquot Sound zone*.
- a harvest level of 339 700 cubic metres per year from operable areas outside of Clayoquot Sound.

As part of the analysis, as published in the *September 2001 Arrowsmith TSA Timber Supply Analysis Report*, a comparison was made between the timber supply forecasts in the 2001 analysis and the previous (1995) timber supply analysis. The main factors that contribute to the differences in the harvest flows are as follows:

- The timber harvesting land base has decreased by about 12 percent due to several small parks as a result of the Vancouver Island Summary Land Use Plan, as well as land exchanges for compensation, new woodlots, riparian reserves and reductions for wildlife tree patches.
- In the 1995 analysis, Clayoquot Sound was modeled separately from the rest of the TSA as a tabular exercise. In the 2001 analysis, Clayoquot Sound was included as part of the timber harvesting land base, but modelled with its own unique forest management constraints that are specific to the *Clayoquot Sound Scientific Panel Report*.
- With the creation of a forest licence for harvesting red alder in the district, some red alder stands have now been included in the timber harvesting land base for the TSA. In the previously analysis, red alder was examined separately.
- Implementation of the Vancouver Island Summary Land Use Plan and approval of the Higher Level Plan has changed forest management practices in designated zones within the TSA. These practices were reflected in the analysis.

In this rationale, I will discuss many of the timber supply analysis assumptions in the context of my considerations for this AAC determination. However, where my review of an assumption has concluded that I am satisfied it was appropriately modelled in the base case forecast as reported in the timber supply analysis, I will not discuss my considerations in detail in this document. However, some factors for which the assumptions were appropriately modelled in the analysis may nonetheless warrant discussion for other reasons, such as a high level of public input, lack of clarity in the analysis report, or concerns resulting from the previous determination for the Arrowsmith TSA. As a result, I may choose to provide my consideration of such factors in this rationale.

I have considered the reasoning used to select the base case forecast and I am satisfied that it provides a suitable basis from which to evaluate the assumptions regarding land base, management practices, and timber yields for the Arrowsmith TSA.

Consideration of Factors as Required by Section 8 of the *Forest Act*

Section 8 (8)

In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(b) the rate of timber production that may be sustained on the area, taking into account

(ii) the composition of the forest and its expected rate of growth on the area,

Land base contributing to timber harvesting

- general comments

As part of the process used to define the timber harvesting land base in the timber supply analysis, a series of deductions are made from the productive forest land base. These deductions account for the factors that effectively reduce the suitability or availability of the productive forest area for harvest, for ecological, economic or social reasons. The deductions in the Arrowsmith TSA timber supply analysis resulted in a timber harvesting land base of 60 097 hectares.

I have considered all of the deductions applied in the derivation of the timber harvesting land base for the Arrowsmith TSA. Those assumptions related to factors associated with deriving the timber harvesting land base for which, based on my thorough review, I accept the assumptions applied in the analysis are not discussed below. These factors include the accounting in the analysis for environmentally sensitive areas and protected areas.

Where my consideration of the information has identified a factor which in my estimation requires discussion in this document, it is described below.

- operability

Those portions of the TSA which are neither physically operable nor economically feasible to harvest are categorized as inoperable, and are excluded from contributing to the timber harvesting land base.

Economically inoperable areas were accounted for by removing low timber productivity and non-merchantable forest types (discussed further in the next factor). Portions of the Arrowsmith TSA that were excluded as being physically inoperable were based on terrain attributes and resulted in a reduction of 23 859 hectares. This area was mapped for the Nanaimo and West Coast blocks. For areas around and west of Duncan, physical operability was not considered a limiting factoring; reductions for low productivity, unstable soils and environmentally sensitive were considered sufficient to account for operability.

A submission from Orval Resource Management Group questioned why three timber licence areas were deducted as inoperable. Staff reviewed the concern and found an operability coding error that resulted in the exclusion of some operable area. Staff submit that about 1250 to 1500 hectares of additional forested area should have been included in the timber harvesting land base. Almost all of the additional operable area is within the

Clayoquot Sound zone, where it represents an increase to the timber harvesting land base of about 20 percent; while for the rest of the TSA it represents an increase of about 2 percent.

I note that operability mapping for the West Coast block was completed in 1994 and for the Nanaimo block mapping was completed in 1988. I suggest that if possible this mapping should be updated and operability should be examined for areas around and west of Duncan prior to the next timber supply review. Except for the adjustment for the operable area within the timber licences, no further concerns were raised regarding the deductions for operability. For this determination, to account for the additional timber licence areas I have considered the timber supply to be underestimated as discussed below, under 'Reasons for decision'.

- low productivity and non-merchantable forest types

Stands that are physically operable and exceed low site criteria but are not utilized because of low timber productivity or volume were excluded from contributing to the timber harvesting land base. In the analysis for the Arrowsmith TSA, stands were deducted if they were not projected to achieve a height of 19.5 metres by 150 years of age; and if they had volumes of less than 300 cubic metres per hectare on the east coast, or less than 400 cubic metres per hectare on the west coast. As well, red alder-leading stands with less than 200 cubic metres per hectare or older than 70 years of age were excluded. A total of 7278 hectares were excluded from the timber harvesting land base to account for these low productivity or non-merchantable forest types.

In the Arrowsmith TSA, colluvium sites are characterized by large boulders, rock and some soil accumulated at the lower reaches of slopes. District staff expressed concern that some reforested colluvium sites are likely not going to achieve full stocking levels in the future. Specifically the district staff question if these sites will achieve 400 cubic metres per hectare by 150 years of age. A preliminary review of the amount of colluvium sites within the timber harvesting land base that could be affected revealed that only about 250 hectares on the west coast if harvested might regenerate with low stocking densities, and therefore are likely to be non-merchantable types.

Having considered the information about low productivity and non-merchantable forest types, I am satisfied that the criteria used was reasonable and suitable for use in this determination. With respect to the concerns about regenerating stands on colluvium sites, I encourage district staff to continue to monitor regeneration of these sites, such that any possible impacts can be better quantified and included in the next timber supply analysis. For this determination, I have considered the colluvium sites to represent a small downward risk to the timber supply as discussed below, under 'Reasons for decision'.

- deciduous forest types

Deciduous forest types are those dominated by broad-leaved, deciduous species. In the Arrowsmith TSA, red alder is the major deciduous species considered commercially viable. All red alder-leading stands on good productivity sites with over 200 cubic metres per hectares and less than 70 years of age were included in the timber harvesting land base. These red alder-leading stands comprise 1923 hectares or 3.2 percent of the timber harvesting land base.

A fifteen year non-replaceable forest licence is currently held by Weyerhaeuser Company Limited for the harvest of 6300 cubic metres per year of red alder stands that are at least 50 percent deciduous by volume.

In the timber supply analysis, the initial base case forecast included a volume component of 6300 cubic metres per year. After the first decade, the red alder harvest contribution declined to zero for fifteen years and then increased to a long-term harvest level of 3000 cubic metres per year.

District staff raised some concerns about the regeneration, volume per hectare and the estimate of the available area of red alder stands. To examine red alder regeneration issues, an operational trial for red alder management has been implemented in the Vancouver Forest Region. As part of this trial, 20 hectares of harvested red alder stands may be regenerated to red alder annually in the Arrowsmith TSA. Since the start of the trial, about 40 hectares have been harvested and regenerated in this manner. To reflect operations, 10 percent of red alder-leading stands harvested in the analysis were modelled to regenerate to the same species (red alder), with the remainder regenerating to coniferous species. BCFS staff expect that a review of the trial will result in further direction on red alder management by the end of 2003.

A sensitivity analysis was conducted to assess the timber supply implications if all harvested red alder-leading stands were instead regenerated to red alder. The results indicated that the different regeneration regime would not impact the overall harvest level in the base case forecast.

In response to the district's concern about the difficulties associated with the limitation on the use of red alder in reforestation, I have the following comments. I recognize that the licensee has collected a significant amount of data on this topic which would appear to support a higher level of regeneration than is currently suggested by the regional trial program. However, BCFS staff are attempting to take a measured approach to reforestation with deciduous species, and as a result the data gathered before the end of 2003 will help to refine a management strategy for the future use of red alder. I expect that the research results will shortly be available upon which to build the appropriate management objectives and regime for this species in the Arrowsmith TSA. In the meantime, I am satisfied that the analysis has appropriately modelled current practice in this regard and I make no adjustments in this regard.

An examination of harvested cutblocks has shown consistently lower scale volumes than reported by cruise reports. Staff advise this could be due to a bias in the current taper equations used for red alder, which may overestimate the amount of volume. Recently, a few alder-leading stands have been sampled as part of some coastal data collected from the 'Net Volume Adjustment Factor' (NVAF) sampling program. The preliminary results from the sample show that the total merchantable volume per hectare may be overestimated by as much as 10 to 20 percent as compared to VDYP projections which were used in the analysis.

Regarding the area of red alder-leading stands that is estimated to be available for harvesting, district staff indicated that many of these stands are concentrated in riparian areas and therefore they may not be available. However staff are not certain how the

reductions for riparian areas applied in the analysis account for this concern (also discussed later in riparian habitat).

Input received from Coast Mountain Hardwoods (previous red alder tenure holder, now held by Weyerhaeuser) expressed the opinion that the harvest level of 6300 cubic metres per year could be increased up to 9000 cubic metres per year, and that state they have the data to support this higher level.

With regard to concerns about the area and volume of available red alder-leading stands, I request that district staff work together with the licensee to identify suitable areas for operations. If a better quantification of the actual area and volume can be agreed upon and made available prior to the next determination, then an informed assessment can be made regarding the ability to achieve harvest level projections as assumed in the analysis over time. In considering the request to increase the deciduous harvest partition level, without this type of quantification I cannot at this time confirm if higher levels of deciduous timber supply are possible, particularly given that the current analysis indicates a short fall in the available red alder supply after the first decade.

In this determination, in consideration of the information discussed above, I believe it is reasonable to assume that the existing partition of 6300 cubic metres per year for red alder-leading stands can be maintained over the five year term of this determination without creating a risk to timber supply, as discussed further below, under 'Reasons for decision'. For the next determination, I request that district staff review the amount of available area and volume of the red alder-leading timber supply.

- roads, trails and landings

In the analysis, a percentage of the productive forested area was excluded to account for the permanent loss of productive land to roads, trails and landings. Separate estimates are made for existing and future access structures, to reflect both potential changes in road building practices and road network requirements over time. Estimates account for the area that is permanently removed from the timber harvesting land base.

As a result of concerns about the amount of productive area lost due to roads, district staff undertook a sampling exercise to improve the estimate of area lost. The sample included over 20 kilometres of varied road types scattered throughout the district. From this sample, an average road width of 10 metres was applied to the total length of all roads. Based on this exercise, a total of 1469 hectares, or 2.4 percent of the operable forest was excluded to account for existing roads, trails and landings. A total of 1381 hectares was excluded over time to account for future roads, trails and landings.

However, upon further review district staff believe that landslide areas were not examined and therefore were not included in the deduction. They have confirmed that a number of landslides are not captured in the sensitive soil or unstable soils deduction. They submit that about 100 hectares of landslides and landslide prone areas have not been accounted for in the analysis.

I have considered the risk to timber supply from overestimating —by about 0.17 percent— the timber harvesting land base due to not accounting for landslide areas as discussed in

'Reasons for decision'. I suggest that staff further review the methodology for accounting for roads and areas prone to landslides for the next analysis.

- woodlot licences

The *Forest Act* requires that AACs determined by the chief forester for TSAs be exclusive of the timber supply contribution from area-based woodlot licences. When a woodlot licence area is proposed, the associated harvest level is part of the AAC for the TSA as the woodlot is area still part of the TSA. Once the licence is issued, in the next subsequent AAC determination for the TSA, the Crown land issued as a woodlot licence and the associated timber supply is excluded from contributing to the AAC for the TSA. The area and annual volume is then managed under the authority of the district manager.

Since the last determination, the district has expanded the woodlot program from 13 licences to 18 licences. All of the issued woodlots with a total Crown area of about 3500 hectares have been excluded from contributing to the AAC for the Arrowsmith TSA.

A submission from Greenmax Resources states that it was inappropriate to portray woodlots as one the primary reasons for an AAC reduction. The submission further states that removing the woodlots from the TSA does not reduce the availability of the woodlot areas to continue to contribute to wildlife tree patches, old growth management areas, etc., unlike parks.

I agree that woodlot areas can contribute to biodiversity and further note that issued woodlots do not reduce the overall amount of harvesting permitted in the district as they continue to be an important part of the overall forest management in an area. If there was misunderstanding that the harvest level for the TSA was projected to decline mainly due to woodlots, then to be clear, the total harvesting activity for the district is not reduced due to removing the woodlot areas from contributing to the AAC for the TSA. They are simply transferred from the area that I base my AAC determination on, to the area that the district manager bases AAC decisions for woodlots on; by law, the area for which I determine an AAC must exclude woodlots (and community forests as discussed below) as their AACs are set by the district manager.

Having considered the information about woodlot licences, I am satisfied that they have been appropriately accounted for in the timber supply analysis. I will make no further adjustments regarding this factor.

- community forest agreements

To project timber supplies for TSAs, area-based community forests are also excluded in the same manner as woodlot licences. The district notes that there is one community forest agreement issued to the Bamfield/Huu-ay-aht Community Forest Pilot Agreement. To account for this tenure in the analysis, 439 hectares were deducted from the timber harvesting land base. I am aware that an additional agreement with the Cowichan Tribes is pending, however the exact boundaries of the licence area, which may cover up to 1600 hectares, has not been confirmed.

In a submission by the Cowichan Tribes, they submit that a Community Forest Pilot Agreement was signed in February 2001, providing an AAC of 20 000 cubic metres. They

state that the area is to come from the small business program area and negotiations are underway to determine the boundaries of the area; in their opinion this should be accounted for in netdowns to the timber harvesting land base. Staff advise that at present the interim measures extension agreement offers 10 000 cubic metres per year.

However, until the boundaries of the Cowichan Tribes community forest agreement area have been confirmed, I consider the analysis assumptions to have appropriately accounted for community forests at this time. I should note that my AAC decision, which only reflects the Bamfield/Huu-ay-aht, does not imply or should not be interpreted as affecting the issuance of any new or additional agreements. My authority here is to only ensure that the AAC I set does not include issued community forests, as once issued and confirmed it is the district manager's authority to determine the AAC for these tenures.

- tree farm licence transfers

Since the last determination, two tree farm licences (TFL 44 held by Weyerhaeuser Canada Ltd. and TFL 46 held by TFL Forest Ltd.), which are partially or wholly located in the South Island Forest District, have changed ownership. The *Forest Act* requires that in the event of a change of ownership, a percentage of the licence AAC may be forfeited back to the Crown if government does not accept alternative transition strategies as outlined in the *Forest Act*. In addition, I am aware that Weyerhaeuser has requested the removal of the Ucluelet Working Circle from TFL 44 and that recently government has agreed to this request.

As a result of these proposed changes, some volume or area may be transferred from the TFLs to the TSA. I have considered this information, however, until the transfers are complete, I cannot speculate or account for the potential impact they may have on the timber supply for the TSA.

Existing forest inventory

The Arrowsmith TSA forest cover was reinventoried in 1988/89. More recently, the Toquart River watershed was reinventoried in 1992. The inventory file used in the analysis was based on disturbance and silviculture activities updated to the end of 1998, and forest cover attributes were projected to 2000.

- volume estimates for existing stands

Volumes for existing coniferous stands older than 50 years and red alder-leading stands were estimated using the Variable Density Yield Prediction (VDYP) model. In 1999, the Arrowsmith TSA Inventory Audit was completed and the results showed that the mature volume component of the forest inventory is statistically acceptable.

I have considered the information regarding the volume estimates for existing stands as applied in the analysis. I am satisfied that the analysis assumptions were appropriate for this determination.

Expected rate of growth

I have considered the information regarding the operational adjustment factors applied to volume estimates for regenerated stands as well as the minimum harvestable ages assumed in the analysis. I am satisfied that the analysis assumptions were appropriate for these factors, and I will not discuss my considerations in detail in this rationale.

- site productivity estimates

Inventory data includes estimates of site productivity for each forest stand. Site productivity is expressed in terms of a site index, which is based on the stand's height as a function of its age. The productivity of a site largely determines how quickly trees grow, which in turn affects the time seedlings will take to reach green-up conditions, the volume of timber that can be produced, and the age at which a stand will reach a merchantable size.

In general, in British Columbia, site indices determined from younger stands (i.e. less than 31 years old), and older stands (i.e. over 150 years old) may not accurately reflect potential site productivity. In young stands, growth often depends as much on recent weather, stocking density and competition from other vegetation, as it does on site quality. In old stands, which have not been subject to management of stocking density, the trees used to measure site productivity may have grown under intense competition or may have been damaged, and therefore may not reflect the true growing potential of the site. This has been verified in several areas of the province where studies—such as the Old-Growth Site Index (OGSI) 'paired plot' project and the 'veteran' study—as well as results from using the Site Index Biogeoclimatic Ecosystem Classification System (SIBEC) suggest that actual site indices may be higher than those indicated by existing data from old-growth forests. Such studies indicate that site productivity has generally been underestimated by the inventory file data; managed stands tend to grow faster than projected by inventory-based site index estimates from old-growth stands.

No local site index studies have been conducted in the Arrowsmith TSA. However, the 1999 inventory audit indicated that, on average, the site indices for young stands are slightly underestimated. Stands younger than 140 years of age comprise about 71 percent of the timber harvesting land base in the TSA.

Two sensitivity analyses were undertaken to examine the timber supply implications if the site index adjustments suggested by the provincial OGSI studies and SIBEC data were appropriate for the stands in the Arrowsmith TSA. In the sensitivity analysis using the OGSI data, site indices of stands older than 140 years (about 29 percent of the timber harvesting land base) were adjusted using either the paired-plot or veteran-tree results, whichever was appropriate. Paired-plot results were applied to coastal Douglas-fir stands older than 140 years and the veteran-tree results were applied to hemlock and balsam stands older than 140 years. Managed stand volumes for those analysis units potentially affected by changes in estimated future productivity were recalculated based on the average adjusted site productivity. Green-up ages and minimum harvestable ages were also recalculated.

The sensitivity analysis results indicate that if site productivity is underestimated to the extent suggested by the OGSI studies, after the seventh decade the harvest level could

increase by 13 percent to 324 250 cubic metres per year for the remainder of the planning horizon.

Although not reported in the analysis report, I have reviewed a second sensitivity analysis, which examined the implications of the SIBEC data. In this sensitivity analysis, site indices for immature stands (stands less than 30 years) were adjusted based on data collected for the Vancouver Region. Forested areas with stands less than 30 years old and greater than 130 years old were assigned to the mesic site series (01) based on leading species and BEC variant. An area-weighted SIBEC site-index was calculated for each analysis unit (pine and red alder were not recalculated, and SIBEC adjustments were not developed for the Clayoquot Sound portion of the TSA). The results of the adjustments increased the initial harvest level to 400 000 cubic metres per year (11 percent above the base case level) for 10 years and in the long term, to 361 000 cubic metres per year (26 percent above the base case level).

The mean adjusted site index based on SIBEC as compared to the mean inventory site index for each analysis unit shows that SIBEC adjustments tend to compress the range of site index values, that is they increase the poor and medium sites, and decrease the value for the good sites.

OGSI adjustments were not applied to redcedar as only limited data has been collected for this species. However, despite this limitation staff advise me that the OGSI sensitivity is more representative than the SIBEC sensitivity due to the lack of site series mapping. Without site series mapping, the assignment of site indices by BEC is speculative, while OGSI is based on provincial paired-plot studies. Staff support the findings of the inventory audit, which also reports that site indices for younger stands are slightly underestimated.

The Orval Resource Management Group, in a submission on behalf of Interfor, questioned the rate of growth assumed in the analysis. They assert that the base case forecast suggests that the average TSA-wide growth rate is only 1.85 cubic metres per hectare per year (m3/ha/yr), while they have evidence that recent harvesting has occurred on a site with a growth rate of 15 m3/ha/yr. Given the extent of distribution of good and medium sites, the group suggests an average growth rate of 8 m3/ha/yr should be used. BCFS staff point out that the OGSI studies show that at the time of harvest the average growth rate is about 6 m3/ha/yr, while in the base case it is about 5.5 m3/ha/yr and ranges from about 3 to 10 m3/ha/yr. I expect that once we have more localized site productivity data with better site series mapping, annual growth rates as assumed in the base case forecast will be more in line with field observations.

I have considered the information about the site productivity of stands regenerating in the Arrowsmith TSA. I acknowledge that some uncertainty exists with respect to the ultimate performance of stands relative to their potential. In particular, I am mindful of the implications of the concerns identified about root diseases as discussed further under *volume estimates for regenerating stands*, which may affect the capacity of some managed stands in the TSA to achieve full stocking and in the timelines modelled in the sensitivity analysis. However, data from the paired-plot study clearly demonstrates that stands are growing at a much faster rate than would be expected based on measurements from the standing old growth inventory. Given existing silvicultural requirements, it is reasonable to expect that full stocking will occur in the majority of managed stands, and that the stands

will be managed to minimize losses to pests and competing vegetation. Therefore, while the exact magnitude of the productivity increase is not certain, I believe it is highly reasonable to expect that most second-growth stands will grow more quickly than productivity estimates from old-growth stands would suggest.

Local data will provide much needed certainty around the magnitude of site productivity adjustments appropriate for the Arrowsmith TSA. To this end, I strongly encourage the collection of data from stands within the TSA over the term of this determination.

In this determination, I am prepared to consider the implications of an underestimation in volumes for regenerating stands as a result of underestimated site productivity. I am satisfied that timber supply in the mid to long term is greater than projected in the base case forecast, by between 0 to 13 percent, although the exact magnitude of this underestimation is as yet uncertain. I will discuss my considerations of this further under 'Reasons for decision'.

- *volume estimates for regenerating stands*

For the Arrowsmith TSA timber supply analysis, the Table Interpolation Program for Stand Yields (TIPSY) was used to estimate the growth and yield of all future regenerated stands. Projected volume gains expected from the use of improved seed were not included in the base case. Operational adjustment factors (OAFs) were applied to adjust the projected yields generated from TIPSY to reflect operational conditions.

Two operational adjustment factors were applied to all volume estimates for regenerating stands. In the analysis, the standard OAF1 of 15 percent was applied to account for less than ideal tree distribution, small non-productive areas, endemic pests and disease, and random risk factors such as windthrow. In addition, the standard OAF2 of 5 percent was applied to the majority of stands to account for decay, waste and breakage. For existing regenerating Douglas-fir stands, an OAF 2 of 12.5 percent was applied and future regenerating Douglas-fir stands, an OAF 2 of 10 percent was applied. The reduction factors applied to regenerating Douglas-fir stands were slightly higher than the typical provincial estimate of 5 percent to account for laminated root rot (*Phellinus weirii)* losses, which I have discussed further below under *impediments to prompt regeneration*. The higher reduction factors were based on advice from the Vancouver Forest Regional Pathologist, using information from *Laminated Root Rot: Ecological Relationships and Stand Productivity Impacts In Coastal Douglas-fir Ecosystems of British Columbia, 1992*.

The Forest Practices Code requires the use of the best genetic quality (seed and vegetative material) source available for regeneration. Select seed produced from seed orchards is the product of B.C.'s forest gene resource management program, which uses traditional tree breeding techniques to select naturally-occurring, well-adapted, healthy and vigorous trees.

Select seed from seed orchards produces trees that grow faster than those collected from natural stands. As a result, a stand composed of such trees has a greater volume at the same age than a natural stand with the same species composition. Current expectations are that the volume differences will begin to decrease beyond a certain stand age.

Information from the BCFS Tree Improvement Branch on the current use and quality of select seed was used to predict volume gains. Using this information, volume increases of

2.7 percent for Douglas-fir, 1.9 percent for hemlock and 1.3 percent for western redcedar were applied to future managed stands in the analysis.

I note that as predicted volume gains from select seed were not applied to the existing regenerating stands, there may be a small, but unquantified underestimation of timber supply. Any underestimation in this regard would likely only affect timber supply in the mid to long term, as select seed has only been in use since the early 1980s and therefore volume gains would not impact the estimated volume of mature stands in the short term.

I am satisfied that volume estimates for regenerating stands represent the best available information. However, having considered the information regarding the use of select seed in existing regenerating stands in the Arrowsmith TSA, and I have accounted for an unquantified upward pressure as discussed further in "Reasons for decision".

(ii) the expected time that it will take the forest to become re-established on the area following denudation,

Expected time for forests to be re-established following harvest

I have reviewed the information regarding not-satisfactorily-restocked areas, and I am satisfied that the assumptions in the analysis for these factors were appropriate. As a result, I will not discuss my considerations in detail in this rationale.

- regeneration delay

Regeneration delay is the period between harvesting and the time at which an area becomes occupied by a specified minimum number of acceptable, well-spaced seedlings.

In the timber supply analysis, a regeneration delay of 2 years was applied to stands on good and medium growing sites based on file reviews, on the experience of district silviculture specialists, and on reviews of compliance records. A regeneration delay of 3 years was applied to poor sites based on historical experience. Three years was applied to red alder-leading sites due to some uncertainty regarding prompt regeneration of red alder as harvesting and reforestation of these stands is fairly new in the TSA

Current practices in the Arrowsmith TSA have been aimed at reducing the regeneration delay by planting areas promptly following harvest. This is supported by silviculture data from district reports (1995-1999) that reflect an average regeneration delay of about one-year for all logged blocks. However, staff submit that although the delay period applied in the base case may therefore seem too long, operational realities of obtaining planting stock, time of harvest completion, and other variables may result in longer delays than one year. Staff indicate that the average regeneration delay is probably somewhere between one to three years.

From the review of the information presented, I am mindful that the potential amount of variance is about one year on some sites. For this determination I will accept the delay periods applied in the analysis as representing the best approximation of average performance and I will make no further adjustments with respect to this factor. I request that district staff monitor trends in regeneration delays such that any refinements in the data can be incorporated into future analyses.

- impediments to prompt regeneration

Impediments to prompt regeneration not accounted for in the analysis could increase the uncertainty in the assumptions related to growth and yield that were used in the timber supply analysis.

District staff indicate that vegetation competition from species such as red alder, big leaf maple and salmon berry is a problem on some regenerating sites in the Arrowsmith TSA. In particular, red alder invasion of free growing stands and on old roadways is of concern to district staff. However, they note that prompt reforestation with select seed and the establishment of high quality planting stock following harvesting improves reforestation success, and reduces the need for repeated brush treatments on susceptible sites.

Also of concern to district staff are mortality losses in young stands from laminated root diseases. As well, animal damage from black-tailed deer and elk causes staff to undertake a significant amount of effort to protect seedlings from browse. Dwarf mistletoe on hemlock is a concern in the Coastal Western Hemlock zone and reforestation regimes for these sites include sanitation treatments of infected trees and planting resistant species. However, staff are satisfied that losses from these sources were accounted for in the operational adjustment factors applied in the base case to regenerated stand yields. Staff indicate that management practices are structured to minimize, to the extent possible, the timber supply implications of these agents, such as the planting of disease-resistant species, or the use of seedling protectors during planting.

I have reviewed the information about impediments to regeneration for stands in the Arrowsmith TSA. As noted above under *volume estimates for regenerating stands*, the operational adjustment factor (OAF 2) that was applied to regenerating Douglas-fir stands is higher (up to 7.5 percent) than the typical provincial estimate of 5 percent. I request that for future timber supply analyses, district staff continue to assess and monitor the losses from laminated root disease, but in this regard I will not make any adjustments for this determination.

(iii) silviculture treatments to be applied to the area,

Silviculture treatments to be applied

- silvicultural systems

The majority of the harvesting in the Arrowsmith TSA is undertaken using even-aged silvicultural systems. Stands on good and medium productivity sites in the eastern portions of the TSA (i.e. - around Nanaimo) provide opportunities for commercial thinning.

Areas suitable for commercial thinning were delineated to reflect the planned or potential management in these areas. In total, 16 000 hectares or 27 percent of the timber harvesting land base was assumed to be suitable for commercial thinning. In the first 20 years of the base case forecast, there was a maximum contribution of 23 700 cubic metres per year attributable to commercial thinning (approximately 165 hectares per year). This represented current performance when the data package was developed. Since then, due to declining market prices for small Douglas-fir logs, the amount of commercial thinning has declined. A sensitivity analysis that investigated changing these assumptions found that the

level of annual commercial thinning does not affect the short- or long-term harvest forecast.

For the remaining area, which is the majority of the TSA, partial retention systems were assumed to apply in the analysis. The term 'partial retention' is used throughout this document and reflects the intent of describing an even-aged silvicultural system.

To estimate the amount of volume reduction to apply to reflect partial retention in the timber supply analysis, a review of silvicultural prescriptions from the licensees and the Small Business Forest Enterprise Program was conducted. It found on the total land base that on average, retention harvesting resulted in 8.5 percent additional area in reserves within cutblocks, over and above those already left for *Forest Practices Code* requirements for riparian habitat and wildlife tree patches, as discussed below under their respective factors. One-half of this (8.5 percent) was being assumed to be retained on the timber harvesting land base; therefore volumes tables were reduced by 4.25 percent for both managed and unmanaged stands.

In 1995, Michael Scot Zens, University of Washington, documented the results of his study of the growth of Douglas-fir and western hemlock trees along forest edges—defined as the boundary between recent harvesting and mature second-growth or old-growth forests—in the Alberni Valley. The results indicate that early stand development along forest edges (where younger trees are shaded from taller adjacent stands) is reduced relative to trees not shaded. However, the study did not provide evidence or quantification of volume impacts that could be used to adjust volumes for the purposes of the timber supply analysis.

I am also aware that Weyerhaeuser's most recent timber supply analysis for TFL 39 included a managed stand volume reduction of 3 to 30 percent to account for the anticipated effects of competition due to shading and edge effects from variable retention leave patches. Yield reductions were 30 percent in the old-growth zone, 11 percent in the habitat zone, and 3 percent in the timber zone. The cumulative timber supply impact of these reductions was 5.4 percent over the entire TFL.

Staff note that determining the timber supply impact of retention systems is difficult due to variables such as the amount of cutblock edge, tree heights, aspect, and time of harvesting adjacent stands, which can cause shading effects that potentially reduces future growth and yield. Further they submit that the 4.25 percent volume reduction may not be sufficient to reflect the growth and yield impacts.

A sensitivity analysis examined the potential timber supply effects if all 8.5-percent of the current level of retention is within the timber harvesting land base, and if future regenerated stands have a 5-percent lower growth rate. The results show an initial harvest level of 347 000 cubic metres per year, which is 3 percent below the initial base case level, and 9 percent lower in the long term.

In the submission from Greenmax, they maintain there is little science to support the assumptions regarding retention harvesting. They submit that any leave trees or edge trees may benefit from loss of competition and actually increase in growth, which they state is happening.

I have considered the information about silvicultural systems and the assumptions in the timber supply analysis. I note that across the province there is an increasing trend to using

alternative silvicultural systems and I have no reason to believe that this trend will not also apply to the Arrowsmith TSA. At the time of the analysis, district staff undertook their best assessment of the volume impact of partial retention. Nonetheless, they are concerned that there will be additional growth and yield losses from the edge effect that may have been underestimated in the analysis.

In summary, I am mindful of a number of unquantified uncertainties regarding factors related to the accounting of partial harvesting, such as the percentage of volume assumed to be retained within cutblocks, and the growth and yield impacts on the edge trees. The findings to date indicate that there is a risk that timber supply impacts maybe higher than assumed in the analysis; and I accept that that timber supply could be overestimated by an unquantified amount. I will discuss this further under 'Reasons for decision'.

- incremental silviculture

Incremental silviculture includes activities such as juvenile spacing, pruning and fertilization that are beyond the silviculture activities required to establish a free-growing forest stand.

The timber supply analysis included assumptions that good and medium productivity hemlock, balsam, spruce, redcedar stands and Douglas-fir stands on all sites would be spaced to between 700 and 900 stems per hectare. There were no specific assumptions in the analysis to account for pruning or fertilization activity in stands.

District staff indicate that the analysis assumptions for juvenile spacing are reflective of past practices in the TSA. However, staff point to the fact that funding for incremental silviculture has been declining and they do not expect future funding to support the same level of spacing.

District staff also indicate that past fertilization activities have occurred on about 13 461 hectares in the TSA. These treatments have an expected volume gain per hectare of between 1.0 and 1.6 percent at the time of harvest. This additional volume was not accounted for in the analysis. Depending on funding, the district plans to continue the fertilization program in the future.

I have reviewed the information regarding incremental silviculture. I note that what was modelled in the analysis attempted to approximate the historical juvenile spacing program in the TSA, and it is difficult to predict future levels of treatment. I accept that the historical levels of spacing may not occur as projected, but I note that any disparity will not have consequential impacts in terms of volume. If the program does change significantly in the future, then the implications to timber supply can be accounted for in a future determination. I am not going to make adjustments in this determination on account of this factor.

With respect to my consideration of the fertilization assumptions in the analysis, I am satisfied that it is appropriate to take into account an inventory volume adjustment as a result of past fertilization. This adjustment is between 0.6 to 0.9 percent of the total inventory volume in the long term. I have considered this adjustment as an upward pressure on timber supply as discussed in 'Reasons for decision'.

(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,

- utilization standards

Utilization standards define the species, dimensions and quality of trees that must be harvested and removed from an area during harvesting operations. The standards used in the timber supply analysis were consistent with values applied regionally and in other coastal units.

District staff indicate that the standards assumed in the analysis differ from current practice in several ways as outlined in the table below:

	Analysis			Operational requirements		
	stump height	dbh	top dib	stump height	dbh	top dib
Natural coniferous <=120 years old	30	17.5	10	30	12.0	10
Natural stands >120 years old	30	17.5	10	30	17.5	15
Red Alder <=40 years old	30	17.5	10	30	12.0	10
Red Alder >40 years old	30	17.5	10	30	17.5	15
Managed coniferous	30	12.5	10	30	12.0	10

With respect to the discrepancies with the minimum top diameter inside bark (dib) standards, I note that review of this factor for other administrative units has shown that differences of the magnitude described have a negligible impact in terms of timber supply. However, I asked staff to provide further clarification on the significance of the discrepancies in minimum diameter at breast height (dbh) values. Staff advise that a review of the Vegetation Resources Inventory data for the Sunshine Coast TSA indicates the net volumes for merchantable coniferous stands under 120 years of age that are compiled using a 12.5 centimetre dbh are 2.5 percent higher than those volumes compiled using a 17.5 centimetre dbh. I would expect similar results in the Arrowsmith TSA.

The coniferous stands under 120 years of age and red alder under 40 years contribute about 11 percent in the base case, and therefore the potential impact on timber supply is estimated to be between 0.2 and 0.3 percent. Having considered the information about the utilization standards in the Arrowsmith TSA, I will take into account a slight underestimation of timber supply of up to 0.3 percent in the long term, and I will discuss this further under "Reasons for decision".

- decay, waste and breakage

The VDYP model used to project volumes for natural stands incorporates estimates of the volumes of wood lost to decay, waste and breakage. Decay losses are built into the volume estimates, while standard waste and breakage factors are applied to the analysis in the development of VDYP yield curves. These estimates of losses have been developed for different areas of the province based on field samples. For regenerated stands, as previously discussed (see *volume estimates for regenerated stands*), the TIPSY model

incorporates OAFs that account for expected future losses due to decay, waste and breakage.

District staff are concerned that there is high amount of volume deducted to account for decay, waste and breakage factors in old-growth western redcedar stands, and therefore the volume of merchantable redcedar is likely underestimated in the analysis. To determine the magnitude of this underestimation, a sample of eight scale returns were examined. The scale returns show that the actual volume harvested exceeds the timber cruised volumes by between 23 to 80 percent, which indicates that about one third more redcedar volume is being recovered than projected by the cruises. Redcedar comprises about 17.8 percent of the merchantable volume in the TSA. Based on this data, accounting for an underestimation of the merchantable redcedar volume indicates that the timber supply may be underestimated by up to 4 percent in the short to mid term in the main portion of the TSA. Due to the higher proportion of redcedar in the Clayoquot Sound area, this underestimation may be slightly higher and extend to the long term for this area.

While the sample size is relatively small, I cannot ignore the large magnitude nor the significance of the possibility that redcedar volumes may be underestimated. While I find the scale returns provide anecdotal evidence, they substantiate similar concerns expressed in other coastal TSAs that the decay, waste and breakage loss factors for old-growth redcedar have been overestimated. Ministry of Sustainable Resource Management staff have reviewed this concern in other coastal TSAs (Queen Charlottes, Kingcome and Arrowsmith). They note that data to assess decay, waste and breakage is sparse for the Arrowsmith TSA, however recently collected data from a 'Net Volume Adjustment Factor' (NVAF) sampling program seems to confirm the trend noted by the district.

While I cannot make a specific adjustment to any of the loss factors used in the timber supply analysis, I am mindful of the results of the sample and recommend that staff undertake the studies necessary to resolve this uncertainty. For this determination, I have considered the possible underestimation of merchantable redcedar as discussed further below, under 'Reasons for decision'.

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production,

Integrated resource management objectives

The Ministry of Forests is required under the *Ministry of Forests Act* to manage, protect and conserve the forest and range resources of the Crown and to plan for the use of these resources so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated. Accordingly, the extent to which integrated resource management (IRM) objectives for various forest resources and values affect timber supply, they must be considered in AAC determinations.

To manage for resources such as water quality and aesthetics, current harvesting practices limit the size and shape of cutblocks and amount of disturbance (areas covered by stands of less than a specified height), and prescribe minimum green-up heights for regenerated stands on harvested areas before adjacent areas may be harvested. Green-up requirements

provide for a distribution of harvested areas and retention of forest cover in a variety of age classes across the landscape.

In the timber supply analysis, as described in the *September 2001 - Arrowsmith Timber Supply Area Analysis Report*, several management zones—for community watersheds, ungulate winter range, visuals, fragmentation, Vancouver Island Summary Land Use Plan, Clayoquot Sound and general management considerations—were created and different forest cover constraints were applied to the stands in each zone.

I have reviewed the information presented to me regarding the analysis assumptions for cutblock adjacency/green-up and visual quality, and I am satisfied that the analysis has appropriately reflected the values and operational constraints for these factors. As a result, I will not discuss my considerations of these factors in detail in this rationale.

- recreation

Recreation areas such as campgrounds, trails and lookout sites are identified in the inventory file through feature significance and management class codes. These identifiers were used in the analysis to exclude areas with high recreation values from the timber harvesting land base. Areas that are managed exclusively for recreation were assumed to not contribute to timber supply. After other exclusions for overlapping objectives, a total of 2175 hectares were excluded specifically for areas with very high or high recreation values.

A submission from the Western Canada Wilderness Committee states that on the east coast of Vancouver Island, only 2 percent of the land base has been set aside for conservation, recreation and tourism needs, yet 87 percent of the population of the island lives within this area. The group says heavy recreational use of the two- percent means red-listed plant communities become toilets, campsites, riding trails, etc. They submit that the expanding population indicates a greater need for recreation areas.

I have considered this input, and I note that although the 2175 hectares were explicitly excluded for recreation, there are numerous other areas in the TSA where harvesting will not be occurring and will be available for recreation. Also the entire Crown forested land base of the TSA represents only 7 percent of the South Island Forest District. Operationally, areas are reserved for riparian habitat and stand-level biodiversity; the temporal distribution of harvesting is subject to meeting landscape-level biodiversity, as well, park areas were entirely excluded from the timber harvesting land base.

The timber supply analysis accounts for all high recreation values areas and therefore reflects the management constraints upon which current practices are presently based. I consider that for the purposes of this determination the constraints on timber supply from areas within the TSA that are currently managed for recreation have been appropriately accounted for in the analysis.

- community watersheds

About 3880 hectares, or 6.4 percent of the timber harvesting land base of the Arrowsmith TSA are contained within designated community watersheds. The Forest Practices Code

and the *Community Watershed Guidebook* provide definitions and management considerations for community watersheds.

In the timber supply analysis, the community watersheds were grouped into a community watershed zone, and a forest cover constraint was applied which limited the amount of harvesting within each watershed to one percent of the productive forest area each year. This constraint was developed based on guidance in the *Community Watershed Guidebook* that indicates that in the absence of a completed Coastal Watershed Assessment Procedure (CWAP), harvesting activity should be limited to 5 percent of the productive forest area over a 5 year period. The recommended constraint was correlated to a one-percent per year harvest limit in the analysis.

In addition, two coastal watersheds — the Gordon and Escalante River drainages — have completed CWAPs and for the purposes of the analysis, these two watersheds were grouped into a coastal watershed assessment zone. This CWAP zone covers 4571 hectares of the timber harvesting land base. Operationally, hydrologists to determine whether planned operations can be conducted without detriment to water quality dependent resources conduct watershed assessments. A CWAP considers the cumulative effects of forest practices on the watershed hydrology. Using the results of the assessments, forest managers can make recommendations concerning the level of further harvesting, if any, in the watershed.

For the Gordon River watershed, constraints were applied such that no more than 24 percent of the timber harvesting land base was permitted to be covered by stands below a hydrological green-up height of 9 metres at any time. This reflects the recommendations contained in the Gordon River CWAP-1998 for the Crown forest land outside TFL 46. This constraint was only applied in the analysis for the first two decades.

For the Escalante River watershed, constraints were applied that limit the amount of harvesting to a maximum of 165 hectares. This reflects the general recommendations contained in the Escalante River CWAP-1999 for the Crown forest land outside TFL 54. Again, this constraint was only applied in the analysis for the first two decades.

For these two watersheds (Gordon River and Escalante), staff advised that when they developed the assumptions for the timber supply analysis they believed that the constraints would only be required for the next 20 years. However, staff are now uncertain about the extent of possible hydrologic recovery within this timeframe since watershed restoration work is still relatively recent (less than 10 years in many cases), and suggest that actual recovery may extend beyond 20 years.

I have reviewed the information about community watersheds, and discussed the information with district staff. While the constraints applied in the analysis are generally consistent with current practice, it is probable that those applied within the Gordon and Escalante River drainages will continue beyond two decades. I have considered this to represent an unquantified but small downward pressure on timber supply in the mid to long term as discussed further under 'Reasons for decision'.

- riparian habitat

Riparian habitats occur along streams and around lakes and wetlands. The Forest Practices Code requires the establishment of riparian reserve zones (RRZs) that exclude timber harvesting, and riparian management zones (RMZs) that restrict timber harvesting, in order to protect riparian and aquatic habitats.

Comprehensive local stream and fish habitat inventories have not been completed for the Arrowsmith TSA, therefore information contained in the 1994 - Wild Stone Resources report was examined. The report contains details of a study of 92 coastal cutblocks that estimated the amount of timber harvesting land base within riparian reserves by multiplying the specified reserve width for each stream class (from the *Riparian Management Area Guidebook*) by the lengths of stream of each class found on the cutblocks sampled, then divided by the total area of cutblocks sampled. Based on this approach the timber harvesting land base was reduced by 4.8 percent to account for riparian reserves in the analysis for the Arrowsmith TSA. In addition to account for riparian management zones, the timber harvesting land base was reduced by 4.2 percent. In total, the timber harvesting land base was reduced by 5953 hectares or 5.3 percent of the productive forest (9.0 percent of the timber harvesting land base) to account for management practices in riparian areas.

I have reviewed the assumptions used in the analysis to account for riparian habitat requirements. I note that the information was based on the 1994 Wildstone Resources report, and therefore the assumptions may not entirely reflect management practices that are specific to the Arrowsmith TSA. In addition, it is difficult to assess whether riparian areas may already be somewhat accounted for by other deductions, such as those applied to account for deciduous stands or wildlife trees patches. However, for this determination I accept the assumptions as representing the best available information, as a result I make no adjustments on this account. For the next determination, I request that district staff work to complete a review of the riparian habitat for the TSA so that more precise reductions can be developed prior to the next timber supply analysis.

- wildlife habitat

The forests of the Arrowsmith TSA provide habitat for a broad diversity of wildlife species, including black bear, black-tailed deer, elk, cougar, marbled murrelet, northern goshawk, bald eagle, Keen's long-eared myotis and Vancouver Island marmot.

Following are my considerations of some of the provisions made in the analysis for wildlife species.

1) ungulate habitat

Ungulate winter ranges (UWRs) in the Arrowsmith TSA are areas delineated as Ew (environmentally sensitive for wildlife habitat). This is consistent with 1998 Forest Practices Code "grandparented" guidelines for ungulate winter ranges. This is an interim approach until ungulate winter range boundaries are developed and legally designated under the Operational Planning Regulation (OPR) provisions, which is expected to occur prior to the October 2003 deadline.

In the timber supply analysis, a total of 1156 hectares delineated as Ew (sensitive for wildlife habitat) were excluded in deriving the timber harvesting land base. This is the same area reduction as applied in the base case forecast for TSR 1.

Staff from the Ministry of Water, Land and Air Protection (MWLAP) state that TSR 1 allowances for UWRs did not provide for winter ranges in the appropriate locations or to the extent required to responsibly conserve ungulate values under the Forest Practices Code. In particular they are concerned about ranges in the Upper Qualicum and Rosewall areas. MWLAP staff intend to assess UWR requirements in these two areas and may apply to establish "new" UWRs as provided by operational planning regulations.

Until the UWR boundaries are confirmed and designated, current practices follow the district manager's 1998 "Objectives for Managing Ungulate Winter Range" as made known to licensees.

I have considered the information about the provisions made in the analysis to account for ungulate winter ranges, and I note that accounting for additional areas may result in further reductions, which can be included in future analyses. For this determination, I accept that the area excluded from the timber harvesting land base provides a reasonable accounting of the area currently managed as ungulate winter range, as a result I make no further adjustments regarding this factor.

2) identified wildlife

'Identified wildlife' refers to species at risk (red- and blue-listed) and to regionally significant species which are potentially affected by forest management activities and which may not have been adequately accounted for with existing management strategies, such as those for biodiversity, riparian management, ungulate winter range or through the application of other forest cover constraints. Species or plant communities at risk as defined under the Forest Practices Code also include those that are not considered at risk provincially but which have regional populations that may be threatened. The intent is that by addressing the habitat needs of 'regionally important wildlife' or unique plant communities early on, the possibility that they will become listed provincially as threatened or endangered at a later date may be avoided.

Volume I of the IWMS was released in February 1999 and details several wildlife species and one plant community that may occur and which require future consideration in the Arrowsmith TSA, including the following: American bittern, northern goshawk, marbled murrelet, Cassin's auklet, Keen's long-eared myotis, and Douglas-fir/Garry oak-oniongrass. Volume II, which has yet to be released, may identify additional species and plant communities. The species identified in Volume I will be managed through the establishment of wildlife habitat areas (WHAs) and implementation of general wildlife measures (GWMs), or through other management practices specified in higher level plans.

A number of WHAs for marbled murrelets have been proposed and are under evaluation thus far in the Arrowsmith TSA. As well, one plant community area comprised of Douglas-fir/Garry oak-oniongrass has been proposed. None of the proposed WHAs were explicitly excluded in deriving the timber harvesting land base in the analysis. District staff note that as a result of nesting habitat concerns for marbled murrelets, some proposed cutblocks in forest development plans have changed from 'active' to 'information' status.

I note that where the habitat values are known to be present, whether inside or outside the defined timber harvesting land base, measures of protection should be undertaken, such as through the establishment of WHAs or old growth management areas (OGMAs). To this end I strongly suggest that the appropriate resource agencies complete the work necessary to establish WHAs.

MWLAP staff suggest that although government has described a one-percent target for the implementation of the IWMS, the impact will likely be higher on the coast and somewhat lower in some parts of the interior. I note that it is not possible at this time to specify the exact location or precise amount of area that will be required to be reserved within the Arrowsmith timber harvesting land base due to implementation of the IWMS. However, given the known presence of identified species such as goshawks and marbled murrelets in the TSA, as well as the expected presence of other identified wildlife species and plant communities, it is clear that there will be WHAs established in the TSA.

The province has committed to implementation of the IWMS and limitation of short-term timber supply impacts to one percent across the province. Given the species known to be present in this TSA, I expect that it is likely that the establishment of WHAs will reduce the timber harvesting land base by the full one percent described by provincial policy. I will thus take into account in this determination a one-percent impact on timber supply, which I believe accommodates those WHAs expected to be established in the near future for most species. I have considered the risk posed to timber supply on this account and I will discuss this further under 'Reasons for decision'.

- stand-level biodiversity

Biodiversity is defined as the full range of living organisms, in all their forms and levels of organization, and includes the diversity of genes, species and ecosystems and the evolutionary and functional processes that link them. Under the Forest Practices Code, biodiversity in a given management unit is assessed and managed at both the stand and landscape levels.

For the analysis, district staff followed procedures in the *Landscape Unit Planning Guide* to determine the wildlife tree patch (WTP) requirement for the analysis. As well, based on the assumptions in the 1996 *Forest Practices Code Timber Supply Analysis*, staff assumed that 75 percent of WTP requirements would be met in the non-contributing areas, such as riparian habitat or areas with sensitive soils. To account for WTP requirements expected to be met in the contributing areas, that is the timber harvesting land base (outside of Clayoquot Sound zone), a total of 1549 hectares or about 2.5 percent of the timber harvesting land base was deducted in the analysis.

In 2000, district staff conducted a review of data from 74 silviculture prescriptions (SPs). The SP data indicated that operationally, only 33 percent of wildlife tree patches are being placed in areas constrained from harvesting on the account of other values. Given that in the analysis, it was assumed that 75 percent of requirements would be met from non-contributing areas, the impact of wildlife tree retention on timber supply could be underestimated. However, as noted above in *silvicultural systems*, the majority of the timber harvesting land base was assumed to be harvested using partial retention systems.

In the base case to account for the retention of trees, volumes were reduced by 4.25 percent for both managed and unmanaged stands.

I have considered the information about the provisions made in the base case to reflect management for stand-level biodiversity. Although I believe that the review of the SP data provides a good starting point from which to identify discrepancies between the analysis assumptions and current practice, I am not convinced that the data necessarily indicates that the impact of management for stand-level biodiversity will be greater than accounted for in the analysis. I note that the review of SPs did not include field checks and covered SPs that were mainly prepared during a time period directly following the full implementation of the Forest Practices Code, and prior to the implementation of retention harvesting.

I acknowledge that staff are uncertain about accounting for stand-level biodiversity. However, in consideration of the above the 2.5 percent land base reduction for WTPs seems comparatively reasonable, and the further 4.25 percent volume reduction for partial harvesting could overlap with achieving objectives for stand-level biodiversity; hence it is not clear to me that additional reductions are necessary. I encourage district staff to continue to refine management objectives for stand-level biodiversity, and monitor the level of WTP retention actually practised, so that the implications to timber supply can be assessed again during the next timber supply review. For this determination, I make no further adjustments regarding this factor.

- landscape-level biodiversity

Achieving landscape-level biodiversity objectives involves maintaining forests with a variety of patch sizes, seral stages, and forest stand attributes and structures, across a variety of ecosystems and landscapes. Managing for biodiversity is based in part on the principle that this—together with other provisions in the Forest Practices Code, such as riparian management, maintenance of wildlife trees, and other forest cover objectives as discussed throughout this document—will provide for the habitat needs of most forest and range organisms. A major consideration in managing for biodiversity at the landscape level is leaving sufficient and reasonably located patches of old-growth forests for species dependent on, or strongly associated with, old-growth forests.

The *Landscape Unit Planning Guide* outlines three biodiversity emphasis options (BEOs)—lower, intermediate and higher—which guide the establishment of biodiversity management objectives for a landscape unit. The guide outlines the proportions of each subregional planning area that should be assigned to each of the three BEOs. The proportions in lower and intermediate biodiversity emphasis can range from 30 to 55 percent, but the average is approximately 45 percent of the area in lower, 45 percent in intermediate, and 10 percent in the higher BEO landscape units. The policy generally followed for timber supply analyses when landscape units and BEOs have not been formally established is to model the distribution of BEOs using a weighted average forest cover requirement.

In the analysis, for the areas outside of Clayoquot Sound zone, the BEOs were derived from Vancouver Inland Summary Land Use Plan (VISLUP). The ratio of higher, intermediate and lower BEOs is 0.4 percent, 59.1 percent and 40.4 percent, respectively for the Arrowsmith TSA. The target amount of old-growth retention in the draft landscape

units (LU) with higher and intermediate BEOs was modelled such that the full amount was met immediately. For the lower BEO units, the initial amount was one third, with the full target amount modelled as retained by 210 years of age.

Staff noted that the area excluded from the timber harvesting land base to account for riparian reserves and riparian management zones (5953 hectares) did not contribute to landscape-level biodiversity requirements. However, it is likely that at least some of the old growth within riparian areas could contribute to the landscape unit targets. A sensitivity analysis that examined the timber supply impact of assuming half of the riparian areas would contribute showed an initial harvest level increase of 1.5 percent in the short term, but no long term impact.

In a submission from the Cowichan First Nation, they expressed concern about adequate representation of mature and old-seral forests across the landscape as they submit this is necessary to maintain ecological integrity and function throughout their traditional territory. A number of other submissions stated disagreement with the allowance of the one third drawdown of old-seral targets; they recommend that the full target be applied immediately particularly since the sensitivity analyses show that meeting these targets now will have a negligible impact on short and long-term harvest levels. The Hul'qumi'num Treaty Group in particular expresses support for this recommendation.

Three sensitivity analyses were conducted to assess the timber supply implications of uncertainty around the modelling of landscape level biodiversity requirements. In the first sensitivity analysis, the full old seral targets were applied immediately in the low BEO areas. The only impact was a minimal decline in harvest flow during the 14th decade. In the second analysis, old, mature and early seral targets were applied immediately in all BEOs landscape units except in the lower BEOs where the old seral target was based on one-third drawdown. This analysis resulted in a very slight decline during the 13th decade. In the third sensitivity analysis, the early, mature and full old seral requirements were applied immediately to all the BEO landscape units and resulted in a somewhat larger dip during the 13th decade.

In response to the public input, I note that the analysis assumptions were made in a manner consistent with provincial policy and the VILUP, and expected to approximate the requirements for landscape level biodiversity. The assumptions regarding a phased-in approach to meeting old seral requirements are also consistent with provincial policy. However, I note that the results of the sensitivity analysis showed timber supply to be relatively insensitive to full application of the old seral requirements in low BEO areas. I also note that the analysis assumptions included an accounting for projected levels of natural disturbance in the inoperable land base, so that the contribution of this area to meeting old growth requirements was not overestimated in the analysis.

In consideration of the analysis assumptions regarding landscape-level biodiversity, I believe that at least some of the old-growth forests retained in riparian reserves should contribute to achieving targets for landscape-level biodiversity. I have considered this as an upward pressure of up to 1.5 percent in the short term as discussed below, under 'Reasons for decision'. Before the next determination, given the remnants of age classes and fragmented nature of the timber harvesting land base, I stress the importance and benefit of completing landscape-unit planning such that the placement of the OGMA can

be confirmed. Thus I encourage MSRM staff to continue their work with landscape unit planning so that any additional information can be incorporated into the next analysis for the Arrowsmith TSA.

- cultural heritage resources

Cultural heritage resources include archaeological and traditional use sites. Archaeological sites contain physical evidence of past human activity, whereas traditional use sites may not necessarily contain historical physical evidence but may indicate current use by a First Nation.

An archaeological overview assessment has been completed for the Arrowsmith TSA and traditional use studies have been undertaken. Archaeological sites exist within the Arrowsmith TSA and most of the recorded cultural heritage sites are located on the west coast of Vancouver Island in close proximity to the coastline. These sites generally overlap with reductions for non-commercial areas in the case of non-forested estuaries, or riparian habitat and wildlife tree patches, thus impact assessments have found few archaeological sites on the timber harvesting land base. Where sites are found—and the primary feature has been culturally modified trees (CMTs)—operations have avoided the sites, either by including the feature in a wildlife tree patch or riparian reserve, or by adjusting the cutblock boundary around the feature.

Following the recommendations of the Clayoquot Sound Scientific Panel (CSSP), a reduction was applied in the base case forecast to account for the area (137 hectares) of existing or potential cultural heritage resource features in Clayoquot Sound. The reduction was based on the recommended criteria that defined potential stands with CMTs as being at least 7 percent of stands that are comprised of a minimum of 20 percent yellow and redcedar trees, are older than 80 years and are within 200 metres of the shoreline.

In a submission from the Hupacasath First Nation, they submit that detailed discussions are needed immediately to identify areas requiring protection based on their needs and values, and to determine if these areas need to be removed from the timber harvesting land base to ensure proper protection. The Cowichan Tribes say that while they believe that removing significant sites from the timber harvesting land base best protects cultural and heritage values, a reduction of 137 hectares is not sufficient. They also say the criteria used to define areas with potential features are inappropriate because they believe sites are found throughout the TSA.

I have considered the information regarding cultural heritage resources and I am mindful that there are uncertainties regarding the exact location and extent of the cultural heritage resources in this TSA. I acknowledge that the base case forecast included our best interpretation of the CSSP recommendations regarding culturally modified trees. I will consider any new information, including any new findings or recommendations by government, at the time of my next AAC determination. For this determination, I note that the AAC that I determine does not prescribe any particular plan of harvesting activity within the TSA by requiring any particular area to be harvested or to remain unharvested. Harvesting activities are guided by requirements such as those contained in the *Heritage Conservation Act*, *Forest Act*, Forest Practices Code, the CSSP and other resource management legislation.

- Clayoquot Sound zone

In April 1993, as I have discussed above in this rationale, the provincial government announced the Clayoquot Sound Land Use Decision. As a result, almost 900 square kilometres (350 square miles) — 34 percent of Clayoquot Sound — is now preserved, including over 700 square kilometres (270 square miles) of coastal temperate rainforest. The decision placed a further 21 percent of the Sound under special management, which allows some sensitive logging while emphasizing the protection of wildlife, recreation, and scenic values. Following this announcement in 1995, the provincial government adopted the recommendations of the Clayoquot Sound Scientific Panel (CSSP).

The recommendations for the Clayoquot Sound area include expectations regarding forest practices, rates-of-cut, and the implementation of variable retention harvesting. As well, watershed plans are to be completed which reserve areas for ecosystem representation, red- and blue-listed plant and wildlife species, cultural values, recreation, hydro-riparian, sensitive soils and unstable terrain and forest interior conditions. In the last determination, I requested that if possible, staff were to further clarify these management practices to determine how they might impact timber supply.

Since then, a comprehensive set of inventories has been completed. Watershed-level plans are a critical component of planning in the area, as they will delineate reserve areas and harvestable areas. Although 15 watershed-planning units have been established, only four plans are nearing completion.

Since 1996, there has been little harvesting in Clayoquot Sound, although I understand that recently some has occurred in TFL 54 and 57.

For the timber supply analysis, a zone — comprised of 5935 hectares of timber harvesting land base — was created to reflect the specific and unique practices in the Clayoquot Sound portion of the Arrowsmith TSA. Although the Panel's report did not include recommendations regarding harvest level flows over time, in keeping with the spirit and intent of the report, a non-declining even flow was applied in the base case forecast. One of the two key recommendations that were directly accounted for in the analysis include the recommendation to retain at least 40 percent of the land base as old-seral forest, which was modelled by applying a constraint such that a minimum of 40 percent of the Crown forest in a watershed must be older than 141 years of age at all times. The other key recommendation reflected in the analysis restricted the amount of harvesting to only 1 percent of timber harvesting land in each watershed per year. In addition, objectives for visually sensitive areas were modelled for each watershed rather than by landscape unit.

The application of these constraints resulted in a harvest level forecast of 11 000 cubic metres per year for the Clayoquot Sound zone. There is currently a partition of 13 700 cubic metres per year for this area.

In the submission from Orval Resource Management Group, they believe that the projected level of 11 000 cubic metres per year should be substantially higher due to adjustments needed to expand the timber harvesting land base, increase volume yields and improve product quality.

District staff submit that the application of the older forest cover constraint (minimum 40 percent) and the one percent rate of harvest underestimates the available timber supply.

Nonetheless, district staff believe that the application of these variables in the analysis accurately reflects the CSSP's recommendations regarding practices in Clayoquot Sound.

According to the submission from the Clayoquot Sound Central Region Board, they are pleased that the same assumptions as in previous reviews were being used for this determination.

Based upon my knowledge of the CSSP's recommendations and the limited amount of actual harvesting in this zone, I believe the methods applied in the analysis are a reasonable extrapolation of the expected practices for this area. In my last AAC determination for the Arrowsmith TSA, I established a partition for the Clayoquot Sound area to ensure that harvesting to the full extent permitted by the AAC would not be concentrated in the areas outside of Clayoquot Sound. Until all the watershed plans are complete, there will continue to be some uncertainty regarding the appropriate timber supply assumptions to reflect management regimes; nevertheless it seems most probable that the timber supply contribution in this area will continue to be limited by the Panel's recommendations and in a manner reasonably well approximated in the analysis. Therefore for this determination, I have maintained a partition for Clayoquot Sound at a level that I will discuss further below, under 'Reasons for decision'.

- fragmentation zone

As noted above in the TSA description, the Arrowsmith TSA consists of several fragmented components, mostly due to past and present levels of rural and urban development. The majority of the smaller fragments are located along the eastern portion of the TSA from Duncan to Nanaimo.

The smaller fragmented parcels total 5320 hectares or 9 percent of the timber harvesting land base. In the timber supply analysis to account for operational constraints, forest cover requirements were applied to this zone such that no more than 10 percent of the timber harvesting land base was permitted to be covered by stands below a green-up height of 5 metres at any time.

Over the years there has been much discussion regarding the ultimate use of these small fragmented parcels. Some have suggested they should be managed as small area-based tenures such as woodlot licences, while others have suggested their highest and best use is for purposes other than forest management. The Crown Land Working Group (a joint group with staff from Land and Water BC; and Ministries of Water, Land and Air Protection, and Forests) is currently evaluating these parcels to determine whether they should continue to be part of the provincial forest. The evaluation will likely include recommendations to delete some parcels of Crown land from the provincial forest; and in other cases they may recommend that other areas be added to the provincial forest. I note that the status of Crown land, and exclusion of timber harvesting activities, may only be changed through legislation, such as the *Lands Act* or *Parks Act*, or higher level plans approved in accordance with the *Forest Practices Code of British Columbia Act*.

A sensitivity analysis that examined the impact to timber supply if these areas were excluded from the timber harvesting land base showed a 6-percent decrease in timber supply in the mid to long term. The impact is not entirely proportional to the area, and does not affect the short term due to the relatively restrictive forest cover constraints

applied in the base case forecast. Until final land-use decisions are made regarding the status of these parcels, district staff will continue to develop forest management strategies for these small parcels.

In addition to the forest cover constraints applied in the base case, three very small and isolated parcels (totalling about 600 hectares of operable forested area) on the Gulf Islands were excluded from the timber harvesting land base. However, as noted above, until final land use decisions are confirmed, these small parcels should continue to contribute to timber supply. While I acknowledge that no timber harvesting is currently planned for these areas, I note that there has been no formal change in their status through legislation and hence it would presuppose the final outcome of any designation if they are excluded from the timber harvesting land base at this time.

For consistency with my stated guiding principles, I must consider these three areas as contributing to the timber supply until their legal status is changed under the appropriate legislation. However, the total contributing area is relatively small and given the application of the same forest cover constraints as applied to the fragmentation zone to these three areas, the potential increase to the short-term timber supply is very small. For this determination, I have considered the information regarding the fragmentation zone, and I find that it has been appropriately modelled in the analysis. I have also considered it necessary to include the three small areas in the timber harvesting land base, as discussed further in 'Reasons for decision'. In the next timber supply analysis, these small areas should continue to contribute, given appropriate forest cover constraints, unless they are given some form of legal designation that would imply otherwise.

(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

Vancouver Island Summary Land Use Plan

In 2000, the Vancouver Island Summary Land Use Plan (VISLUP) was endorsed by government, followed by a higher level plan order that implements the specific sections of the plan under the Forest Practices Code. The VISLUP covers the entire South Island Forest District, except for private land and Clayoquot Sound. The plan identifies three management zones: Special Management, Enhanced Forestry and General Management. In the timber supply analysis, the first two zones were specifically accounted for, as they require management regimes that influence timber supply beyond the parameters normally reflected in timber supply analyses.

To account for specific management in the Enhanced Forestry Zone, a 1.3-metre green-up height for cutblock adjacency was modelled. In Special Management Zones, a minimum of 25 percent of the Crown forest land was maintained as mature forest (generally older than 80 years in most cases) at all times. In addition, 3105 hectares of timber harvesting land base were deducted for small parks as a result of the plan.

An Inter-Agency Management Committee is undertaking the ongoing review of the implementation of the VISLUP. Staff are satisfied that the analysis suitably reflects the provisions of the VISLUP to the extent possible. Any new information regarding implementation that might further impact timber supply can be incorporated into future analyses.

First Nations considerations

I am aware that there are many First Nations (as listed below) with reserves or asserted traditional territories in the Arrowsmith TSA. First Nations were provided with copies of the analysis report and the public discussion papers, and were invited to provide their comments.

The following are First Nations that have, or may have, aboriginal interests in the TSA:

Ahousaht Band
Beecher Bay Band
Campbell River Band
Cape Mudge Band
Chemainus Band
Comox First Nation
Cowichan Tribes
Cowichan Lake First Nations
Ditidaht Band
Halalt First Nation
Hesquiaht First Nation
Homalco Band
Huu-ay-aht First Nation
Hupacasath First Nation
Lyackson First Nation
Malahat Band
Mowachaht/Muchalat Band
Nanoose First Nation
Pacheedaht Band
Penelakut Band
Qualicum First Nation
Sliammon Band
Snuneymux First Nation
Toquaht Band
Tla-o-qui-aht First Nation
Tseshaht Band
T'sou-ke Nation
Tsartlip Band
Uchucklesaht First Nation
Ucluelet Band

In the submission received from the Hupacasath First Nation, they state that a Hupacasath land-use plan must be developed and an AAC established for their territory, which would complement land-use planning already underway. They express concern about sustainability of the resources within their asserted territory. I have considered these concerns, and while I acknowledge them, with respect to an AAC established by territories, as I state in my 'Guiding Principles,' my AAC determination is independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply. Regarding land-use planning, I cannot be certain that if such a process were undertaken, that timber supply in the TSA would be affected.

In response to the reports, the Cowichan First Nation submit that a substantial portion of the Crown land within the Cowichan Tribes traditional territory is within this TSA, and they wish to advise of the existence of their aboriginal title to these lands and resources. Further they express concern that the AAC decision may allow resources to be alienated from their land at an unacceptable rate. They ask that I assume the fiduciary responsibility of the Crown and give priority to aboriginal title by removing some land from the timber harvesting land base to ensure the availability of land that has not been recently harvested for treaty settlement, and/or to establish an AAC that is sufficiently low to ensure it can be apportioned so that Crown land within the traditional territory is not harvested prior to treaty settlement.

In a similar submission from the Hul'qumi'num Treaty Group, they submit that the Arrowsmith TSA makes up the vast majority of Crown land in Hul'qumi'num traditional

territory. They say the rate of harvest from their aboriginal title lands must not compromise the forest resources available for interim measures and final treaty settlements, noting that about 40 percent of the timber harvesting land base is within their traditional territory. They submit that a portion of their aboriginal title lands be removed from the timber harvesting land base, including a significant portion of the Vancouver Island Plantation Lands within their core traditional territory as these lands have been selected as settlement lands in treaty negotiations; and that the AAC be set at a sufficiently low level to accommodate the goals of retaining the current and future quality of the mature forest resource in their lands.

I have considered the information contained in the submissions in making my determination. With respect to setting the AAC at a sufficiently low level to accommodate the goal of retaining mature forests, as noted above in 'Guiding Principles,' my determination does not prescribe a particular plan of harvesting activity within the Arrowsmith TSA, including which forest stands are to be harvested or remain unharvested. I also note that there are many areas of old-growth forests retained in the TSA for biodiversity, riparian habitat, culturally modified trees and protected areas, and at present I am not able to determine any further retention requirements. Regarding the opposition to on-going harvesting during treaty negotiations, the current timber supply forecasts clearly demonstrate there is continued availability of mature timber into the future. I note that until the outcomes of treaties are final, it continues to be my position that in determining AACs it would be inappropriate to remove some undetermined amount of land from the timber harvesting land base until land-use decisions have been made.

In March 1994, a two-year Interim Measures Agreement between the provincial government and hereditary chiefs of the Nuu-chah-nulth Central Region Tribes was signed. The agreement established the Clayoquot Sound Central Region board, a joint management process between First Nations and provincial government appointees. As discussed above in this rationale, the board was established to oversee development in Clayoquot Sound, including implementation of the Clayoquot Sound Land Use Decision and the recommendations of the Scientific Panel. In April 1996, the agreement was extended for a three-year period and in March 2000, a new five-year extension agreement was signed.

Many of the First Nations listed above have entered into treaty negotiations under the British Columbia Treaty Process. I am aware that the Nuu-chah-nulth Tribal Council, Te'mexw Treaty Association, Hul'qumi"num Treaty Group, Hamatla Treaty Society, Hupacasath First Nation, Snuneymeux First Nation, and Ditidaht/Pacheedaht First Nations are all engaged in treaty negotiations under the British Columbia Treaty Process at this time. I am also aware of the Hw' te shutsun Interim Measures Agreement with Cowichan Tribes; the Interim Measures Memorandum of Understanding with the Ditidaht and Pacheedaht First Nations; the Clayoquot Sound Interim Measures Extension Agreement with the Clayoquot Sound First Nations; the Interim Measures Extension Agreement with the Huu-ay-aht First Nation and the Uchucklesaht Tribe; the Agreement Respecting Management of Forest Resources with the Te'mexw Treaty Association; and the Agreement Respecting Management of Forest Resources with the Hul'qumi'num Treaty Group.

In addition, I am aware that there are Douglas Treaties that cover part of the TSA. These treaties were originally signed many years ago and provide rights to hunt and fish. In general, I believe that hunting, fishing, and other traditional uses within the TSA can continue without timber supply impacts additional to those projected in the base case through provisions of the Forest Practices Code, such as protection of riparian areas and management for biodiversity, and during operational planning.

I have considered all the available information and I observe that the nature and scope of timber supply impacts, if any, remain uncertain. Based on my knowledge of and familiarity with the technical details of timber supply forecasts, I am aware that changes in timber supply do not always translate into AAC impacts in the short term.

In summary, I will consider any new information, including any decisions on treaty negotiations with First Nations that are undertaken by government, at the time of my next AAC determination. If new information contradicting any of my conclusions becomes available during the effective term of this determination, I may re-visit this determination sooner than five years.

In the meantime, as I have noted in my 'Guiding Principles,' the AAC that I determine should not in any way be construed as limiting the Crown's obligations resulting from recent court decisions including those of the Supreme Court of Canada. As I make my AAC determination, I am mindful of the responsibility of other statutory decision-makers to administer the determined AAC consistently with other legislation, and with relevant court decisions respecting the interests of First Nations.

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,

Alternative rates of harvest

The nature of the transition from harvesting old growth to harvesting second growth is a major consideration in determining AACs in many parts of the province. In the short term, the presence of large volumes of older forests often permits harvesting above long-term levels without jeopardizing the sustainability of future timber supply. In keeping with the objectives of good forest stewardship, AACs in British Columbia have been and continue to be determined to ensure that current and medium-term harvest levels will be compatible with a smooth transition toward the usually (but not always) lower long-term harvest level. Thus, timber supply should remain sufficiently stable so that there will be no inordinately adverse impacts on current or future generations. To achieve this, the AAC determined must not be so high as to cause later disruptive shortfalls in supply nor so low as to cause immediate social and economic impacts that are not required to maintain forest productivity and future harvest stability.

Two alternative harvest level forecasts were examined, given the current management regime and assumptions for the Arrowsmith TSA. The assumptions for these two forecasts are discussed in detail in the *September 2001 Arrowsmith Timber Supply Area Analysis Report*.

The first alternative forecast tested the maximum even-flow harvest level that could be attained over the planning horizon. This alternative resulted in an immediate 28-percent

reduction from the current AAC of 400 000 cubic metres to a steady long-term harvest level of 286 250 cubic metres per year. The maximum even-flow level is the same as the long-term harvest level projected in the base case forecast to begin in the 8th decade.

The second alternative harvest forecast tested the maximum initial harvest level that could be attained without unacceptable future disruptions in timber supply. This alternative illustrated that the current AAC of 400 000 cubic metres could be met as an initial harvest level and maintained for the first decade before declining by 15 percent for three decades to a mid-term level of 263 000 cubic metres per year. In this forecast, the harvest level then increased to the same long-term level as the base case, although 15 years later than projected. This alternative harvest forecast provides me with an indication of some flexibility of the short-term timber supply for the TSA, which I have considered as discussed further, under 'Reasons for decision'.

I have reviewed the alternative harvest forecasts provided, and I am satisfied that the harvest flow presented in the base case forecast reasonably balances the short- and long-term socio-economic objectives given the current management regime, and provides a suitable basis from which to evaluate the assumptions applied in the analysis.

Community implications

A socio-economic analysis was conducted as part of the timber supply analysis, in which the impact of timber supply adjustments on local communities and the provincial economy was assessed. The assumptions and findings of the socio-economic analysis are presented in the *2001 Arrowsmith Timber Supply Area Analysis Report*.

Based on census data collected in 1996, forestry activities, including harvesting, silviculture and forest products manufacturing supports about 9 percent of the workforce in the South Island Forest District. The level of forestry activities varies substantially within the forest district. In Port Alberni and Lake Cowichan, the forestry sector accounted for 36 percent and 33 percent of income, respectively. In Ladysmith and Duncan, the forestry sector accounted for 24 percent and 20 percent of income, respectively. In contrast to these more forestry dependent areas, forestry in Victoria and on the Gulf Islands accounted for about 1 percent of income, and in the Parksville-Qualicum area forestry accounted for 8 percent of the income flowing into the region.

During the 1993 to 1997 cut-control period, the average annual harvest was close to the AAC of 400 000 cubic metres. However, more recently from 1998 to 2000, the actual harvest level in the Arrowsmith TSA was about 290 000 cubic metres per year.

The base case forecast indicates an immediate 11 percent reduction in the timber supply to a harvest level of 357 000 cubic metres per year. This change could lead to a reduction in direct forestry sector employment of about 40 person-years from full employment levels. Those workers who may be affected by this reduction would likely be those who are part of the labour force that generally experiences more sporadic periods of work.

The current AAC of 400 000 cubic metres, if fully harvested and processed, could support about 396 person-years of direct forestry employment and a further 488 person-years of indirect and induced employment across the province. Residents of the Arrowsmith TSA account for about 69 percent of the direct employment. The employment income

associated with this direct, indirect and induced employment would be about $33.9 million per year.

Based on the average 1998–2000 harvest, the provincial government currently collects about $12.4 million per year in stumpage and related payments, other industry taxes and provincial income taxes. Fully harvesting the apportioned volumes of timber in the Arrowsmith TSA could result in annual government revenues of up to $17.1 million, the majority of which would be stumpage and related payments.

A significant amount of the public input received in response to the timber supply review related to socio-economic considerations.

A submission from Pacific Rainforest Adventure Tours says that the TSA is not as dependent on the forest industry as it is on tourism, and notes the lack of representation of tourism stakeholders in land and resource management planning.

Greenmax Resources submits that the socio-economic analysis gives the impression that lower levels of employment in the forest sector are inevitable and acceptable. The company says they do not share this opinion and state that a more proactive approach would stimulate economic activity. They suggest that the recent undercut of the AAC should be allocated and harvested, thereby allowing employment benefits to be attained. They further submit that the focus of the *Analysis Report* is an attempt to justify the further reduction of the working forest area, which they do not support. They say this focus indicates a preservationist approach that minimizes the important contributions of sustainable forest resource management, especially near the urban/rural interface.

On the other hand, 3 submissions say the Timber Supply Review should be put on hold, no AAC should be set, and no further logging allowed until there has been a complete inventory of private and Crown lands, and a commitment to an ecosystem-based or landscape level plan that includes entire watersheds regardless of tenure.

In summary, I have considered the public input and the socio-economic analysis and am aware of the potential implications to communities, and to revenue and incomes due to changes in the harvest levels for the TSA.

(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities,

Timber processing facilities

I have reviewed the information regarding the timber processing facilities in the Arrowsmith TSA, which is part of the larger South Island Forest District. Overall in the district, there are a significant number of processing facilities. In general, the timber harvested from the TSA represents a small portion of a much larger source of timber harvested from elsewhere in the district, such as from tree farm licence areas, woodlots, and private lands. In addition, other sources outside the district including other TSAs collectively provide wood supply for various timber processing facilities within the district. Nonetheless, I am aware of the reliance that the local timber processing facilities have on the timber harvested from the Arrowsmith TSA.

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia,

Minister's letters and memorandum

For the Arrowsmith TSA, the Minister has expressed the economic and social objectives of the Crown for the province in three documents to the chief forester—a letter dated July 28, 1994 (see Appendix 3), a memorandum dated February 26, 1996, (see Appendix 4), and in a letter dated September 17, 1996 (see Appendix 5). The 1994 letter and 1996 memorandum include objectives for forest stewardship, a stable timber supply, and allowance of time for communities to adjust to harvest-level changes in a managed transition from old-growth to second-growth forests, so as to provide for community stability.

In the September 1996 letter, the Minister of Forests recognizes the unique and complex history of forest management in the Clayoquot Sound area. The Minister expresses as an economic and social objective of the Crown, the confirmation of government's intention that timber harvesting continue to be a forest management objective for the Clayoquot area and that this management be carried out in accordance with the Forest Practices Code and the recommendations of the Scientific Panel. I have taken this to mean the Scientific Panel's recommendations need to be considered in this determination. I have discussed this in the section of this rationale entitled "Clayoquot Sound zone".

The Minister stated in his letter of July 28, 1994, that "any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability." He placed particular emphasis on the importance of long-term community stability and the continued availability of good forest jobs. To this end he asked that the chief forester consider the potential impacts on timber supply of commercial thinning and harvesting in previously uneconomical areas. To encourage this the Minister suggested consideration of partitioned AACs.

The Minister's 1996 memorandum addressed the effects of visual resource management on timber supply. It asked that pre-Code constraints applied to timber supply in order to meet VQOs be re-examined when determining AACs in order to ensure they do not unreasonably restrict timber supply.

I have considered the contents of the two letters and the memorandum in my determination of an AAC for the Arrowsmith TSA. In preparing the data assumptions for the timber supply analysis, district staff have already implemented measures to optimise the timber supply in the TSA consistent with good forest management and in accordance with direction from the Minister of Forests. These measures were fully reflected in the base case forecast.

Local objectives

The Minister's letter of July 28, 1994, suggests that the chief forester should consider important social and economic objectives that may be derived from the public input in the timber supply review where these are consistent with government's broader objectives. The BCFS provided a number of opportunities for public input through the timber supply review process for the Arrowsmith TSA, including opportunities to review the data package and the timber supply analysis and to respond to the public discussion paper.

Numerous open houses and meetings were held to obtain feedback. In response, a number of submissions were received from licensees, First Nations, interest groups, and individuals. A summary of this public input is reproduced in full as Appendix 6.

As with all AAC determinations, regardless of whether the input is specifically discussed in this document, I have considered all of the public input received in my determination of an AAC for the Arrowsmith TSA. Some of the opinions expressed in the input relate to items outside my mandate to take into account as chief forester under my legislated authority for an AAC determination (section 8 of the *Forest Act*). For example, suggestions about allocation of timber harvesting rights are within the mandate of the Minister of Forests and not the chief forester. Opinions were expressed from individuals or groups recommending that the AAC be either increased, maintained or decreased. While I acknowledge the opinions expressed, I note that any decision that I make on the harvest level for the TSA must be predicated on sound information, and I cannot speculate about land use or other decisions which have not been taken by government. As also mentioned elsewhere in this document, I am satisfied that the timber supply analysis provides me with a sound basis on which to assess the timber supply for the TSA.

I have considered all public input received on the timber supply review. Local objectives and public input are both very important components of this determination and where possible I have attempted to respond briefly to this input in this rationale.

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

Unsalvaged losses

I have reviewed the analysis assumptions about unsalvaged losses in the Arrowsmith TSA, and I am satisfied that losses were appropriately accounted for in the base case forecast. As a result, I will not explicitly discuss my considerations in this rationale.

Reasons for decision

In reaching my AAC determination for the Arrowsmith TSA, I have considered all of the factors presented to me, and I have reasoned as follows.

In the 2001 timber supply analysis, the initial level in the base case forecast was 357 000 cubic metres per year, representing an 11 percent decline from the current AAC of 400 000 cubic metres. This initial level could only be maintained for one decade before declining by 11 percent per decade for several decades to reach the mid-term level of 263 000 cubic metres per year, and then increasing after 7 decades to reach the steady long-term harvest level of 286 250 cubic metres per year. The base case forecast is comprised of 11 000 cubic metres per year attributable to stands in Clayoquot Sound, 6300 cubic metres per year to red alder-leading stands, and 339 700 cubic metres per year to conifer-leading stands outside of Clayoquot Sound.

Section 8 of the *Forest Act* requires me to consider a number of factors in the determination of an AAC for a timber supply area. In determining an AAC, my considerations identify factors which, when considered separately, indicate that the timber supply may actually be greater or less than that projected in the base case forecast. Some factors can be quantified and their impacts assessed with some reliability. Others may influence timber supply by introducing an element of risk or uncertainty to the decision, but cannot be reliably quantified at the time of the determination.

I am satisfied that the assumptions applied in the base case forecast for the majority of the factors applicable to the Arrowsmith TSA were appropriate. Following is my consideration of those factors for which I consider it necessary in this determination to further take into account implications to the timber supply as projected in the base case forecast.

Factors which indicate that the timber supply projected in the base case forecast may be overestimated, and to a degree that can be quantified to some extent, are as follows:

1) *colluvium areas* – I accept that as a result of identified concerns about stocking levels on colluvium sites, there is a risk that the timber harvesting land base may be overestimated by about 250 hectares. This represents a downward pressure on timber supply of about 0.5 percent. This factor affects timber supply across all time horizons;

2) *existing roads* – I accept that the timber harvesting land base has been overestimated by about 0.17 percent as a result of landslide and landslide prone areas which were not accounted for in the analysis. This factor also acts across the entire analysis horizon;

3) *identified wildlife* – in order to account for the expected implementation of the IWMS, I accept that timber supply has been overestimated by 1 percent across the entire analysis timeframe.

There are also some factors that indicate that the timber supply projected in the base case forecast may be overestimated, but to a degree that cannot be well quantified, as follows:

1) *silvicultural systems* – I accept that there is a risk that partial retention has some additional timber supply impacts than those captured in the analysis. This represents an unquantified downward pressure on the mid- to long-timber supply;

2) *coastal watersheds* – I accept that is reasonable to expect that the management constraints applied in the Gordon and Escalante River watersheds will be extended beyond the 20 years reflected in the analysis. This represents an unquantified but likely small downward pressure on the timber supply in the mid to long term;

In addition to those factors which indicate that timber supply may be overestimated in the base case forecast, I have also identified a number of factors which indicate that the forecast likely underestimates timber supply, as follows:

1) *timber licence areas* – I am satisfied that about 1250 to 1500 hectares of timber licence areas were incorrectly excluded and should contribute to the timber harvesting land base. This additional forested area, mostly in Clayoquot Sound, represents an upward pressure on timber supply of 20 percent in Clayoquot across the entire forecast timeframe, and about 2 percent in the mid to long term in the remaining TSA; and should be taken into account;

2) *utilization standards* – as a result of a slight discrepancy between the standards assumed in the analysis and those practiced operationally, I accept that timber supply has been underestimated by up to 0.3 percent in the short to long term;

3) *decay, waste and breakage* – the amount of merchantable redcedar volume has likely been underestimated due to high loss factors applied in the analysis to account for decay, waste and breakage. I have considered this to represent an upward pressure between 0 to 4 percent (the range of uncertainty associated with this factor) in the short to mid term in the main portion of the TSA, and in the short to long term in Clayoquot Sound, which has proportionately more merchantable redcedar.

4) *landscape-level biodiversity* – I accept that at least some of old growth within the riparian habitat area should contribute to landscape-level biodiversity targets. This represents an upward pressure on timber supply of about 1.5 percent in the short term only.

There are also some factors that indicate that the timber supply projected in the base case forecast may be underestimated, but to a degree that cannot be well quantified, as follows:

1) *site productivity* – I am satisfied that the productivity of second-growth forests will be greater than indicated by data collected from existing old-growth forests. As a result, timber supply has likely been underestimated, however the exact magnitude of this underestimation is uncertain, although it may be as much as 13 percent. This influences timber supply more in the mid to long term;

2) *select seed* – the impact of using select seed for reforestation was not accounted for in the base case and hence the predicted volume gains from this seed source were not applied to the existing regenerating stands. This represents a small, but unquantified underestimation of timber supply in the mid to long term;

3) *fertilization* - as the result of fertilizing 13 461 hectares, which was not accounted for in the base case, I accept that timber supply has been underestimated by between 0.6 to 0.9 percent in the long term.

In consideration of the factors mentioned above, I have the following observations.

Of those factors indicating timber supply has been overestimated in the short to long term, only three—colluvium sites, landslides and identified wildlife—can be reasonably well quantified. These factors additively indicate that timber supply in the base case forecast has been overestimated by 1.67 percent in the short to long term. Two other factors—silvicultural systems and coastal watersheds — indicate timber supply might be overestimated, but the influence of each on timber supply is less quantified and likely impacts the mid- to long-term timber supply.

Next, I will speak to the consideration of those factors indicating that timber supply as shown in the base case forecast has been underestimated. Although not locally quantified for the TSA, the factor with the greatest potential impact on the timber supply is site productivity. Sensitivity analysis results indicate that the mid- to long-term timber supply could be underestimated by up to 13 percent on this account. In addition, the inclusion of timber licence areas indicates that the timber supply has been underestimated by about 2 percent relative to the entire TSA (the impact to the Clayoquot Sound zone is discussed below). However, I consider the impact acts to increase the mid- to long-term timber supply in the main portion of TSA. Therefore in the short term, there are only three factors—utilization standards, decay, waste and breakage, and landscape-level biodiversity —that have an influence, the sum of which indicates the timber supply has been underestimated by an amount between 1.8 percent to 5.8 percent, given the range of uncertainty associated with redcedar loss factors.

I have examined the interaction of the factors influencing timber supply, and find that on balance the factors indicate the timber supply has been underestimated in the base case projections by an amount at the highest end of the range of about 4 percent, and at the lowest end of the range by zero. In considering the factors influencing the short-term timber supply, I believe that in the short term, the trend is towards a more favourable timber supply than projected in the base case. In reaching this assessment I have considered the alternative harvest flows (as discussed above, under *alternative rates of harvest)* that indicate the current AAC of 400 000 cubic metres could be achieved in the initial decade without compromising the timber supply in the long term. However, the rate of decline in the short term was more rapid and the lower mid-term level was projected for 15 years longer than the base case forecast. In the longer term, I expect that the factors acting to increase the timber supply will increasingly offset the downward influences, particularly given that the productivity of second-growth forests will likely be higher than currently projected by up to 13 percent.

I am also mindful there are two additional factors—select seed and fertilization—that were not accounted for in the base case forecast and therefore the timber supply may be additionally underestimated. However, these factors would only impact the mid- to long-term timber supply.

At this point in my reasoning, I have not specifically discussed, or placed weight on the upward or downward factors as they influence the existing partitions for deciduous stands and the Clayoquot Sound area. Regarding Clayoquot Sound, I note that two upward factors—*timber licences* and *decay, waste and breakage*—are proportionately more influential in the Clayoquot Sound area due to the higher percentage of timber licences that

were excluded and the higher amount of redcedar found in Clayoquot as compared to other areas within the TSA. As a result, the estimated size of the timber harvesting land base (5935 hectares in that area) is about 20 percent larger than reported in the analysis; and the projected volume from redcedar stands is at least 4 percent greater. In addition, the productivity of second-growth forests could be up to 13 percent higher than currently projected, although the exact amount remains uncertain. Given that the timber supply projections for the Clayoquot Sound zone are based on a steady even-flow, I believe the timber supply for this zone has been underestimated by at least 20 percent in the short term, as well as in the long term. On this account, although the base case projected a harvest level of 11 000 cubic metres per year from the Clayoquot Sound zone, I find no reason to reduce the level from that set for the current partition, and therefore maintain the partition at 13 700 cubic metres per year. If there is evidence gathered over the course of the next five years that suggests this level is inappropriate, I will review this again in the next determination.

Now to the consideration of the existing partition of 6300 cubic metres for red alder-leading stands with at least 50 percent red alder by volume. Based on my review of information as discussed under *deciduous forest types*, I will maintain this partition at the same level. As noted above in the deciduous factor, I believe it is reasonable to assume that the existing partition for red alder-leading stands can be maintained in the short term without creating a risk to timber supply.

Therefore apart from the Clayoquot Sound and deciduous partitions, in consideration of the quantifiable factors acting to increase the base case forecast (which reflected an 11-percent decrease from the current AAC), I note that the cumulative influence—of those factors that act to increase the timber supply in the main TSA outside the Clayoquot Sound areas and deciduous stands—is about 4 percent in the short term. Hence I consider the portion of the current AAC attributable to the main TSA is 353 300 cubic metres, which is 7 percent lower than the current level (380 000 cubic metres per year).

For consistency with my stated guiding principles, I have included the three very small and isolated parcels on the Gulf Islands in the area that contributes to the timber supply. Until their legal status has been officially altered by the appropriate legislation, I will not presuppose the final outcome of some future land designation. However, I acknowledge that the timber supply contribution from these areas is very small and constrained, and therefore their inclusion does not cause me to specifically adjust the projections for the TSA.

In consideration of all of the information provided, I believe that an appropriate harvest level for the Arrowsmith TSA in this determination is 373 300 cubic metres.

Determination

I have considered and reviewed all the factors as documented above, including the risks and uncertainties of the information provided. It is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years, that reflects current management practices as well as the socio-economic objectives of the Crown, can be best achieved in the Arrowsmith TSA by establishing an AAC of 373 300 cubic metres.

This harvest level includes a partition of 6300 cubic metres per year for red alder-leading stands with at least 50 percent deciduous species by volume, and a partition of 13 700 cubic metres per year for Clayoquot Sound.

This AAC excludes all volume issued to woodlot licences since the 1996 determination.

If additional significant new information is made available to me, or major changes occur in the management assumptions upon which I have predicated this decision, then I am prepared to revisit this determination sooner than five years.

Implementation

In the period following this decision and leading to the subsequent determination, I encourage BCFS staff to undertake the tasks and studies noted below that I have also mentioned in the appropriate sections of this rationale document. I recognize that the ability of staff to undertake these projects is dependent on available staff resource time and funding. These projects are, however, important to help reduce the risk and uncertainty associated with key factors that affect the timber supply in the Arrowsmith TSA.
I recommend that district staff:

- update operability mapping for the West Coast and Nanaimo supply blocks, and examine operability west of Duncan,
- monitor stocking densities on colluvium sites to assess if further timber supply adjustments are required,
- review the amount of area of harvestable red alder-leading stands, and their merchantable volume,
- review the methodology for accounting for roads and landslide areas,
- collect site productivity data from stands within the TSA to determine if adjustments are appropriate,
- monitor trends in regeneration delays to refine data for future analyses,
- continue to assess and monitor the losses from laminated root disease to confirm appropriate operational adjustment factors,
- undertake studies to resolve the concern about appropriate loss factors to account for decay, waste and breakage in existing redcedar stands,
- complete a review of, or develop a tracking system for the amount of riparian habitat in the TSA to facilitate the development of local reduction factors,

- monitor the level of wildlife tree patch retention and the interaction between this retention and the use of retention harvesting systems,
- given the remnants of age classes and fragmented nature of the timber harvesting land base within the TSA, work with other agencies and stakeholders to complete landscape-unit planning, including the placement of OGMAs,
- continue to work with Ministry of Water, Land and Air Protection and stakeholders to implement IWMS, including the designation of wildlife habitat areas.

Larry Pedersen
Chief Forester

August 13, 2002

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the Forest Act, Revised Statutes of British Columbia 1996, reads as follows:

Allowable annual cut

8. (1) The chief forester must determine an allowable annual cut at least once every 5 years after the date of the last determination, for

(a) the Crown land in each timber supply area, excluding tree farm licence areas, community forest areas and woodlot licence areas, and

(b) each tree farm licence area.

(2) If the minister

(a) makes an order under section 7 (b) respecting a timber supply area, or

(b) amends or enters into a tree farm licence to accomplish the result set out under section 39 (1) (a) to (d),

the chief forester must make an allowable annual cut determination under subsection (1) for the timber supply area or tree farm licence area

(c) within 5 years after the order under paragraph (a) or the amendment or entering into under paragraph (b), and

(d) after the determination under paragraph (c), at least once every 5 years after the date of the last determination.

(3) If

(a) the allowable annual cut for the tree farm licence area is reduced under section 9 (3), and

(b) the chief forester subsequently determines, under subsection (1) of this section, the allowable annual cut for the tree farm licence area,

the chief forester must determine an allowable annual cut at least once every 5 years from the date the allowable annual cut under subsection (1) of this section is effective under section 9 (6).

(4) If the allowable annual cut for the tree farm licence area is reduced under section 9 (3), the chief forester is not required to make the determination under subsection (1) of this section at the times set out in subsection (1) or (2) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 9 (2).

(5) In determining an allowable annual cut under subsection (1) the chief forester may specify portions of the allowable annual cut attributable to

(a) different types of timber and terrain in different parts of Crown land within a timber supply area or tree farm licence area, and

(b) different types of timber and terrain in different parts of private land within a tree farm licence area.

(c) [Repealed 1999-10-1.]

(6) The regional manager or district manager must determine an allowable annual cut for each woodlot licence area, according to the licence.

(7) The regional manager or the regional manager's designate must determine a rate of timber harvesting for each community forest agreement area, in accordance with

(a) the community forest agreement, and

(b) any directions of the chief forester.

(8) In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area,

(ii) the expected time that it will take the forest to become re-established on the area following denudation,

(iii) silvicultural treatments to be applied to the area,

(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and

(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,

(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities,

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia, and

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

- - - - - -

Appendix 2: Section 4 of the *Ministry of Forests Act*

Section 4 of the *Ministry of Forests Act* (consolidated 1988) reads as follows:

Purposes and functions of ministry

4. The purposes and functions of the ministry are, under the direction of the minister, to

(a) encourage maximum productivity of the forest and range resources in British Columbia;

(b) manage, protect and conserve the forest and range resources of the government, having regard to the immediate and long term economic and social benefits they may confer on British Columbia;

(c) plan the use of the forest and range resources of the government, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the government and with the private sector;

(d) encourage a vigorous, efficient and world competitive timber processing industry in British Columbia; and

(e) assert the financial interest of the government in its forest and range resources in a systematic and equitable manner.

Documents attached:

Appendix 3: Minister of Forests' letter of July 28, 1994

Appendix 4: Minister of Forests' memo of February 26, 1996

Appendix 5: Minister of Forests' letter of September 17, 1996

Appendix 6: Summary of Public Input

File: 10100-01

JUL 2 8 1994

John Cuthbert
Chief Forester
Ministry of Forests
595 Pandora Avenue
Victoria, British Columbia
V8W 3E7

Dear John Cuthbert:

Re: Economic and Social Objectives of the Crown

The *Forest Act* gives you the clear responsibility for determining Allowable Annual Cuts, decisions with far-reaching implications for the province's economy. The *Forest Act* provides that you consider the social and economic objectives of the Crown, as expressed by me, in making these determinations. The purpose of this letter is to provide this information to you.

The social and economic objectives expressed below should be considered in conjunction with environmental considerations as reflected in the Forest Practices Code, which requires recognition and better protection of non-timber values such as biodiversity, wildlife and water quality.

The government's general social and economic objectives for the forest sector are made clear in the goals of the Forest Renewal Program. In relation to the Allowable Annual Cut determinations you must make, I would emphasize the particular importance the government attaches to the continued availability of good forest jobs and to the long-term stability of communities that rely on forests.

Through the Forest Renewal Plan, the government is taking the steps necessary to facilitate the transition to more value-based management in the forest and the forest sector. We feel that adjustment costs should be minimized wherever possible, and to this end, any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability.

.../2

Province of
British Columbia

Minister of
Forests

Parliament Buildings
Victoria, British Columbia
V8V 1X4

In addition to the provincial perspective, you should also consider important local social and economic objectives that may be derived from the public input on the Timber Supply Review discussion papers where these are consistent with the government's broader objectives.

Finally, I would note that improving economic conditions may make it possible to harvest timber which has typically not been used in the past. For example, use of wood from commercial thinnings and previously uneconomic areas may assist in maintaining harvests without violating forest practices constraints. I urge you to consider all available vehicles, such as partitioned cuts, which could provide the forest industry with the opportunity and incentive to demonstrate their ability to utilize such timber resources.

Yours truly,

Andrew Petter
Minister

Province of British Columbia
OFFICE OF THE MINISTER

Ministry of Forests

MEMORANDUM

File: 16290-01

February 26, 1996

To: Larry Pedersen
Chief Forester

From: The Honourable Andrew Petter
Minister of Forests

Re: The Crown's Economic And Social Objectives Regarding Visual Resources

Further to my letter of July 29, 1994, to your predecessor, wherein I expressed the economic and social objectives of the Crown in accordance with Section 7 of the *Forest Act*, I would like to elaborate upon these objectives as they relate to visual resources.

British Columbia's scenic landscapes are a part of its heritage and a resource base underlying much of its tourism industry. They also provide timber supplies that are of significant economic and social importance to forest industry dependent communities.

Accordingly, one of the Crown's objectives is to ensure an appropriate balance within timber supply areas and tree farm licence areas between protecting visual resources and minimizing the impact of such protection measures on timber supplies.

As you know, I have directed that the policy on management of scenic landscapes should be modified in light of the beneficial effects of the Forest Practices Code. In general, the new policy should ensure that establishment and administration of visual quality objectives is less restrictive on timber harvesting. This change is possible because alternative harvesting approaches as well as overall improvement in forest practices will result in reduced detrimental impacts on visually sensitive areas. Also, I anticipate that the Forest Practices Code will lead to a greater public awareness that forest harvesting is being conducted in a responsible, environmentally sound manner, and therefore to a decreased public reaction to its visible effects on the landscape. In relation to the Allowable Annual Cuts determinations that you make, please consider the effects that the new policy will have in each Timber Supply Area and Tree Farm Licence.

.../2

In keeping with my earlier letter, I would re-emphasize the Crown's objectives to ensure community stability and minimize adjustment costs as the forest sector moves to more value-based management. I believe that the appropriate balance between timber and visual resources will be achieved if decisions are made consistent with the ministry's February 1996 report *The Forest Practices Code: Timber Supply Analysis*.

Finally, in my previous letter I had asked that local economic and social objectives be considered. Please ensure that local views on the balance between timber and visual resources are taken into account within the context of government's broader objectives.

Andrew Petter
Minister of Forests

File: 10100-01

September 17, 1996

Larry Pedersen
Chief Forester
Ministry of Forests
595 Pandora Avenue
Victoria, British Columbia
V8W 3E7

Dear Larry Pedersen:

Re: Social and economic objectives of the Crown in the Clayoquot Sound area

The government of British Columbia recognizes that the circumstances and history surrounding the development of forest management policy for the Clayoquot Sound area are complex and unique in British Columbia. In particular, government has accepted the recommendations of the report of the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound.

Since these circumstances are specific to the Clayoquot Sound area, it is appropriate to express social and economic objectives of the Crown for this area specifically, in addition to the more generally applicable objectives expressed in the letter dated July 28, 1994, and the memo dated February 26, 1996, from the Minister of Forests to the Chief Forester.

In that respect, first, I confirm that it is government's intention that timber harvesting continue to be one of the forest management objectives for the Clayoquot area. Second, it is government's intention that management of the area be carried out in accordance with both the Forest Practices Code and the recommendations of the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound.

These intentions should be read as an expression of the socio-economic objectives of the Crown for the Clayoquot Sound area, for consideration in the determination of allowable annual cuts for those management units which include parts of Clayoquot Sound.

Yours truly,

David Zirnhelt

David Zirnhelt
Minister of Forests

Arrowsmith Timber Supply Area
Timber Supply Review

Summary of Public Input

BC Ministry of Forests
South Island Forest District
4885 Cherry Creek Rd.
Port Alberni, BC V9Y 8E9

August, 2002

This is a summary of the public input received on the Timber Supply Review in the Arrowsmith Timber Supply Area. This summary does not assess the feasibility or validity of the input or whether it relates to the clearly defined mandate of the chief forester in the allowable annual cut determination.

Arrowsmith Timber Supply Area

Background

As part of the review of timber supply in the Arrowsmith Timber Supply Area (TSA), two opportunities were provided for public input. The first followed release of the Arrowsmith TSA *Data Package* and *Information Report* in May 2000. The *Information Report* was a non-technical summary of the draft data and management assumptions that were to be applied in reviewing the timber supply for the Arrowsmith TSA. A 30-day review period, ending June 12, 2000, was provided for the public to comment on these documents.

On September 25, 2001, the British Columbia Forest Service released the *2001 Arrowsmith Timber Supply Area Analysis Report* and *Public Discussion Paper*. The public was encouraged to review and comment on the accuracy of the information in these documents and to provide additional information during the seven-week review period that ended November 13, 2001.

This report summarizes the input received during both public review periods. This information was provided to the chief forester for his consideration when he reviewed the allowable annual cut (AAC) for the Arrowsmith TSA. The first section of this summary outlines the public review process implemented by the Forest Service, and describes the types of public input received. The second section summarizes the public input in sufficient detail to indicate the range of input received. The original submissions (with personal identifiers removed in accordance with the *Freedom of Information and Protection of Privacy Act*) can be reviewed at the South Island Forest District office in Port Alberni.

Public Review Process and Response

Staff from the South Island Forest District actively solicited public input on the Timber Supply Review in the Arrowsmith TSA through the following actions:

- copies of the *Data Package* were mailed to local governments, First Nations, MLAs, forest licensees and government agencies.
- copies of the *Public Discussion Paper* and the *Analysis Report* (which includes the socio-economic analysis) were mailed to stakeholders in the TSA, including First Nations, licensees, Small Business Program registrants, businesses, local governments and environmental groups. The dates of upcoming meetings and open houses were provided.
- the *Data Package* and *Analysis Report* were available at the district office in Port Alberni and at the regional office in Nanaimo.
- newspaper advertisements were placed, advising of the availability of all documents for review by the public and of the schedule of public open houses on the *Analysis Report*.
- copies of all the documents were made available to the local media. Interviews were conducted with the local radio and newspaper.
- referrals were made to the Ministry of Forests website where documents were available to download.

As Table 1 shows, several information sessions and open houses were held on the *Arrowsmith Timber Supply Area Analysis Report*. However, most of the meetings and open houses were poorly attended, the latter averaging about five people.

The forest district and regional offices received four written submissions on the *Data Package* and eight submissions on the *Analysis Report* (see Appendix 1).

Activity	Date
Information sessions	
Local government	
District of Nanaimo	Oct. 2/01
Alberni/Clayoquot Regional District	Oct. 3/01
Cowichan Valley Regional District	Oct. 24/01
Comox/Strathcona Regional District	Oct. 30/01
First Nations	
West Coast First Nations	Oct. 10/01
East Coast First Nations	Oct. 11/01
Others	
Non-gov't organizations	Oct. 9/01
Gov't agencies	Oct. 12/01
Licensees	May 25/00 & Oct. 16/01
Clayoquot Central Region Board	Oct. 26/01
Open houses	
Tofino/Ucluelet	Oct. 4/01
Pt. Alberni	Oct. 15/01
Duncan	Oct. 23/01
Nanaimo	Oct. 24/01

Table 1: Dates and locations of meetings and public open houses

Public Input

In this section, public input on the information presented in the Timber Supply Review documents for the Arrowsmith TSA is summarized under the following headings:

- Data Package (and Information Report)
- Timber Supply Area Analysis Report (and Public Discussion Paper)
- Other comments

Data Package

Roads, Trails and Landings
The Coulson Group says the use of the mapping exercise to estimate the land base lost to roads is acceptable, but that the average width used (20 metres) is a gross overestimation. They suggest using a 10-metre width in the Barclay Supply Block and an 8-metre width in the Nanaimo Supply Block. The Group says they also disagree with an allowance for new roads to access commercial thinning, saying that existing roads are used and these have already been included in the reduction for permanent roads.

Community Forests
The Coulson Group says AAC reductions to account for community forests should be applied against the Small Business Forest Enterprise Program only, and not against major tenure holders. The Group says the small business program has the majority of the AAC allocation, while small replaceable tenures have recently had significant AAC reductions that have threatened their viability.

Cultural Heritage Values
The Coulson Group says the proposed seven per cent reduction from all cedar types within 200 metres of the ocean shoreline to protect cultural heritage values is excessive. They say their experience in Arrowsmith and Strathcona TSAs indicates that land base reductions have been very few and, when they were made, only involved two to three hectares. The Group suggests a two per cent reduction to protect these values, and that actual operational reductions be traced in order to validate this assumption.

Timber Supply Area Analysis Report

Land Base Factors
Greenmax Resources says they strongly disagree that fragmented areas should be removed from the working forest. They say woodlot licences are specifically designed to manage small parcels of land on a sustainable basis that is acceptable to the community. Greenmax claims that the South Island Forest District failed to take advantage of the

opportunity to create new and or expanded woodlot licences. They also point to various conflicting statements in the *Analysis Report* about these fragmented areas and their effect on timber supply.

Greenmax also expresses concern about the removal of Crown lands on the southern Gulf Islands from the timber harvesting land base (THLB). They say they require evidence that forest development plans were not approved, before commenting further.

Woodlots and Community Forest Licences
Greenmax says that portraying woodlots as one of the primary reasons for reductions in the AAC is misleading and unsupportive of their important role, noting that there is in fact only one woodlot of 331 hectares. The company says removing woodlot licenses from the land base considered in the timber supply analysis does not reduce the true availability of forest resources, unlike parks, wildlife tree patches, etc.

The Cowichan Tribes say a Community Forest Pilot Agreement was signed with them in February, 2001, providing an AAC of 20,000 cubic metres. The land base is to come from the small business program area and negotiations are underway to determine the boundaries of the area; this should be accounted for in netdowns to the THLB, according to this submission. The Hul'qumi'num Treaty Group expresses support for this recommendation.

Silviculture Systems
Greenmax says it is difficult to understand the section of the *Analysis Report* dealing with retention harvesting, and maintains there is little science to support the assumptions in this section.

Recreation Values
The submission from the Western Canada Wilderness Committee (WCWC) says that on the east coast of Vancouver Island, two per cent of the land base has been set aside for conservation, recreation and tourism needs, yet 87 per cent of the population of the island lives within this area. The group says heavy recreational use of the two per cent means red-listed plant communities become toilets, campsites, riding trails, etc. WCWC says the expanding population indicates a greater need for recreation areas.

Riparian Management
The Cowichan Tribes say intact and well-managed riparian zones provide fish habitat (central to Cowichan culture) and areas for spiritual and cultural activities, as well as supporting essential ecosystem processes. They say the provisions of the Forest Practices Code, and therefore the land base netdown in the timber supply analysis, are insufficient to protect riparian areas. In particular, the Cowichan Tribes say the width of riparian management zones must be increased and small fish-bearing streams and streams that are not "known" to have fish in them must also be protected. The Hul'qumi'num Treaty Group expresses support for these recommendations.

Landscape Biodiversity
The Cowichan Tribes say adequate representation of mature and old forests across the landscape is necessary to maintain ecological integrity and function throughout their traditional territory. They express concern about insufficient representation of such forests given the high proportion of private lands adjacent to the TSA and the limited regulatory control over them. The Cowichan Tribes request the chief forester to require that seral stage targets be met immediately in all landscape units at the biogeoclimatic variant level, noting that the sensitivity analyses demonstrate a negligible effect on short- and long-term harvest levels from meeting these requirements. The Hul'qumi'num Treaty Group expresses support for this recommendation.

The Hupacasath First Nation say they do not support the liquidation of old-growth

forests in the TSA, saying this has a direct, negative impact on their ability to exercise their aboriginal rights (e.g., sacred and spiritual practices, accessing canoe logs). They also express concern about the impact of this policy on ecosystem sustainability.

WCWC says they're pleased the Sensitive Ecosystem Inventory for the East Coast of Vancouver Island has been completed and the area has been recognized as a high priority for restoration and conservation. The group says that due to the high biodiversity values, 20 to 30 per cent of the region needs to be protected to maintain the species present. WCWC also questions the Ministry of Forests' goals for maintaining and restoring older second-growth forests.

Cultural Heritage Values

The Hupacasath First Nation says detailed discussions are needed immediately to identify areas requiring protection based on their needs and values, and to determine if these areas need to be removed from the THLB to ensure proper protection. They also request more information on the Archaeological Overview Assessment referred to in the *Analysis Report*.

The Cowichan Tribes say that while they believe that removing significant sites from the THLB best protects cultural and heritage values, a netdown of 137 hectares is not sufficient. They also say the criteria used to define areas with potential features are inappropriate (e.g., the statement that potential areas must be less than 200 metres from the ocean; they say significant sites are found throughout the landscape). The Cowichan Tribes say archaeological assessments should be conducted on all TSA lands within their traditional territory and this information should inform the decision on netdowns. The Hul'qumi'num Treaty Group expresses support for these recommendations.

First Nations

The Cowichan Tribes say a substantial portion of the Crown land within their traditional territory is within the Arrowsmith TSA, and they wish to advise of the existence of their aboriginal title to these lands and resources. The Cowichan Tribes express concern that Timber Supply Review decisions will alienate land and resources within their territory before a treaty has been concluded, and say this constitutes bad faith negotiations unless their consent is given. Given that the Delgamuukw decision required that aboriginal title be given a priority, the Cowichan Tribes call on the chief forester to assume the fiduciary responsibility of the Crown and prioritize aboriginal title by:

- removing some land from the THLB to ensure that land that has not been recently harvested is available for treaty settlement; and/or,
- establishing an AAC that is sufficiently low to ensure it can be apportioned so that Crown land within their traditional territory is not harvested prior to treaty settlement.

The submission from the Hul'qumi'num Treaty Group (HTG) says the Arrowsmith TSA makes up the vast majority of Crown land in Hul'qumi'num traditional territory. The HTG chiefs say the rate of harvest from their aboriginal title lands must not compromise the forest resources available for Interim Measures and final treaty settlements. Noting that about 40 per cent of the THLB is within HTG traditional territory, the HTG recommends that:

- a portion of the aboriginal title lands be removed from the THLB, including a significant portion of the Vancouver Island Plantation Lands within the HTG core traditional territory as these lands have been selected as settlement lands in treaty negotiations; and,
- the AAC be set at a sufficiently low level to accommodate the goals of retaining the current and future quality of the mature forest resource in HTG lands.

The HTG submission also expresses the opinion that First Nations title interests and the social and economic goals of HTG chiefs must

be recognized in the Timber Supply Review, and consultation must occur with the chiefs.

The Hupacasath First Nation says their first priority is ensuring the sustainability of the resources within their territory, to fulfill their role as stewards and so they can fully exercise their aboriginal rights. They say a Hupacasath land use plan must be developed and an AAC established for their territory.

Clayoquot Sound

The Orval Resource Management Group, in a submission on behalf of Interfor, raises various questions about the assumptions used to define the AAC for the Clayoquot Sound portion of the TSA. These issues include:

- the definition of inoperable areas in three Timber Licence areas, given the improved technology available.
- the rate of growth assumptions. The proposed AAC suggests annual growth of only 1.85 cubic metres per year, while recent harvesting occurred on a site with a growth rate of 15 cubic metres per year. Given the extent of good and medium sites, the group suggests an average growth rate of eight cubic metres per year should be used.
- the land base reductions for reverted Timber Licences are not explained. Except for losses to roads and slides, all plantation areas should contribute to the AAC.
- the 87 per cent reduction of unreverted Timber Licence area, due to inoperability. Closer scrutiny is needed.

Socio-Economic Factors

A submission from Pacific Rainforest Adventure Tours says a high quality tourism experience depends on the conservation of resources and the protection of diverse ecosystems. This submission says there is currently not a balance between harvesting and ecosystem protection, and this is required soon as proven by the Sensitive Ecosystems Inventory. This submission also expresses the belief that the TSA is not as dependent on the forest industry as it is on tourism, and notes the lack of representation of tourism stakeholders in land and resource management planning.

Greenmax Resources says the socio-economic analysis gives the impression that lower levels of employment in the forest sector are inevitable and acceptable. The company says they do not share this opinion and a proactive approach would stimulate economic activity. They suggest finding a solution to the undercut of the AAC so that employment can increase.

Other Comments

Many submissions comment on factors or issues other than those specifically covered by Timber Supply Review documents. These comments are summarized in this section.

Timber Supply Review Process

The Clayoquot Sound Central Region Board expresses support for the use of the same assumptions in this Timber Supply Review as in previous reviews.

An individual submission expresses the hope this process will be more democratic and responsive to residents than was the Vancouver Island Land Use Plan process.

Three submissions say the Timber Supply Review should be put on hold, no AAC should be set, and no further logging allowed until there's a complete inventory of private and Crown lands, and a commitment to an ecosystem-based or landscape level plan that includes entire watersheds regardless of tenure. The following reasons are offered:

- the huge amount of private forest land that is virtually unregulated and provides water supplies for all east coast communities must be brought into an overall plan.
- a higher level plan is needed to define a conservation vision that allows 12 per cent of a biologically diverse and endangered ecosystem to be protected, consistent with

recent scientific data.
- future tourism employment opportunities and recreational needs require a secure land base.

Greenmax Resources expresses the opinion that the focus of the *Analysis Report* is an attempt to justify the further reduction of the working forest area, which they do not support. They say this focus indicates a preservationist approach that minimizes the important contributions of sustainable forest resource management, especially near the urban/rural interface.

Management Practices and Tenures
An individual submission says that from a biological perspective, it's apparent present forest management is not sustainable because it negatively impacts biodiversity, wildlife habitat, recreation, tourism, culture and watersheds. This individual says it's time to make the industry responsible for the damage it does and to implement practices that are sustainable and not destructive to so many other systems.

A submission from WCWC asks various questions about the E&N lands, and says it's imperative that access to Crown land within the E&N area be the same as for every other area of Crown land in BC (access for conservation, recreation, tourism and woodlots).

Harvest Levels
Coast Mountain Hardwoods requests that the AAC for their deciduous forest licence be increased retroactive to 1996, because the AAC was based on a significant underestimate of the volume per hectare and the net operable land base. The company says they want their AAC increased to 9,000 cubic metres and will provide technical information to support that request.

The Hupacasath First Nation say they do not support an AAC above the long-term harvest level because it is not sustainable, and they do not agree with the short-term liquidation of old growth that is used to rationalize that situation.

Orval Resource Management Group, on behalf of Interfor, addresses the AAC for the Clayoquot portion of the TSA. The Group says the base case harvest forecast of 11,000 cubic metres per year should be reconsidered in favour of a substantial upward adjustment. The following reasons are provided:
- the definition of inoperable and the growth rate assumptions are too conservative.
- the industry is in crisis and unemployment is growing, yet the AAC is being reduced by 11 per cent on a land base that can support a higher cut.
- the need to increase yields and product quality, and expand the THLB.

Orval says that, based on comparisons with TFL 54, the AAC for the Clayoquot portion should range from 35,935 cubic metres to 48,148 cubic metres.

Appendix 1

Submissions received by the South Island Forest District

Submissions received on the Data Package

Interest groups
Clayoquot Sound Central Region Board

Forest industry
Coast Mountain Hardwoods Inc.
The Coulson Group

General public
One individual submission

Submissions received on the Timber Supply Analysis Report

First Nations
Cowichan Tribes
Hupacasath First Nation
Hul'qumi'num Treaty Group

Forest industry
Orval Resource Management Group (on behalf of Interfor)
Greenmax Resources

Interest groups
Neighbours of Little Qualicum
Western Canada Wilderness Committee, Mid-Island Chapter

General public
One individual submission

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